Gas Journal

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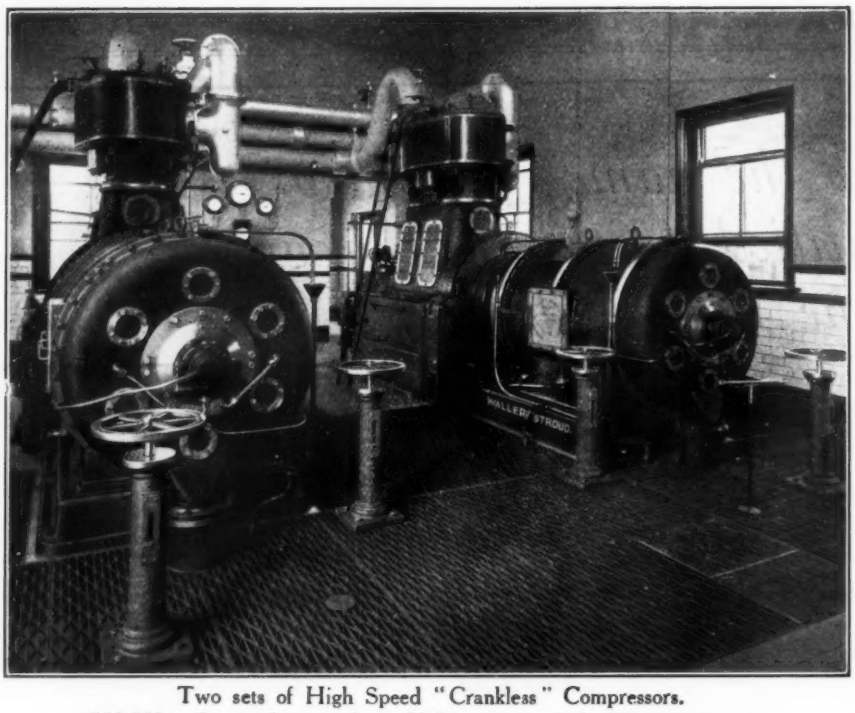

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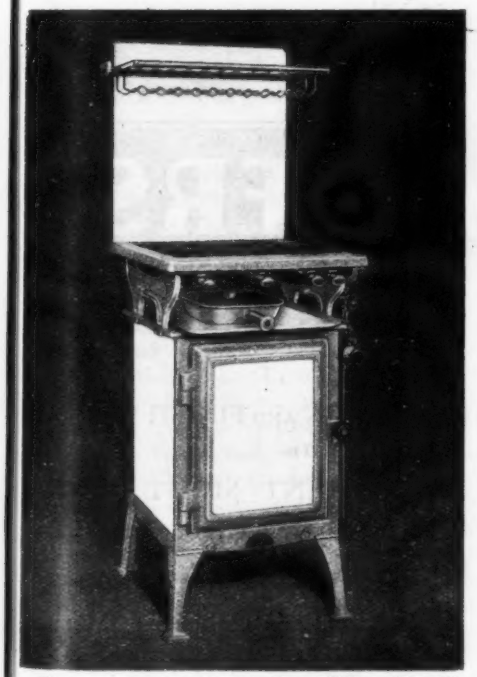

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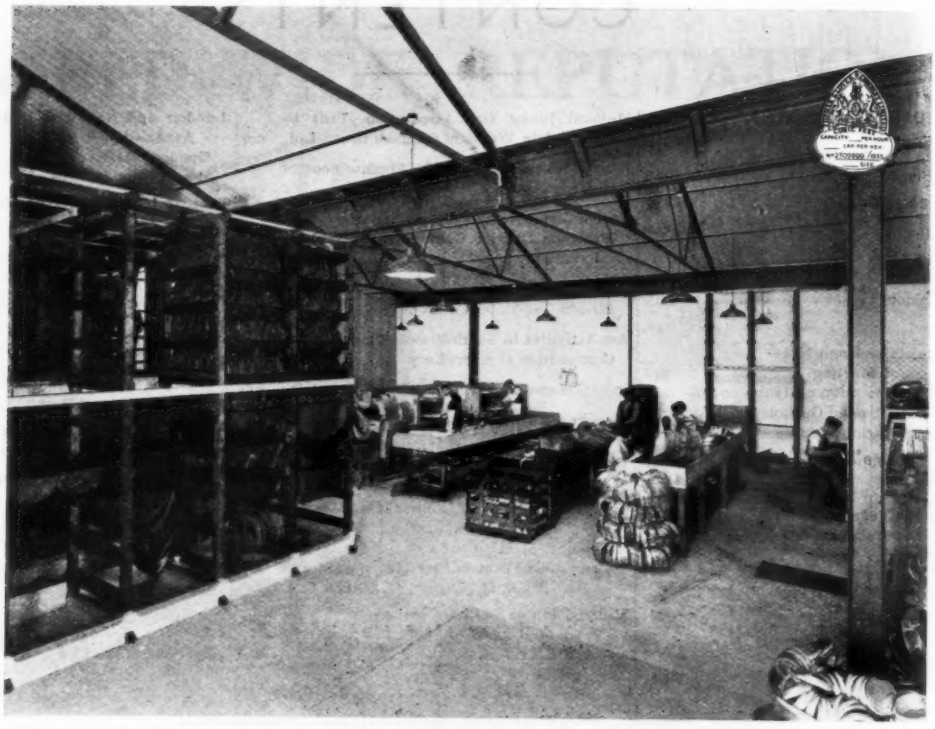

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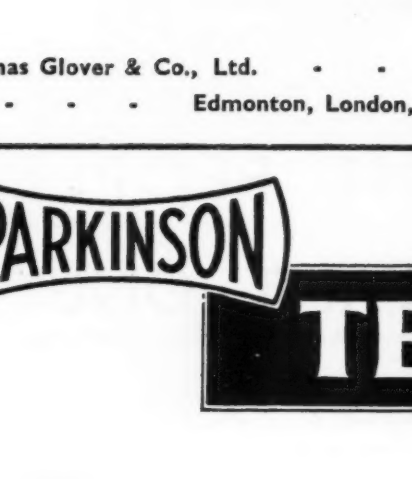

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Gas Journal

OCTOBER 23, 1935

Vol. 212. 87th Year No. 3779

Editorial Notes

Coke Marketing

A PAPER of much importance in regard to the future of coke oven development was presented by Dr. G. E. Foxwell and Mr. W. L. Boon to the Northern Section of the Coke Oven Managers' Association last week. The coke oven industry can be divided into two parts—coke ovens attached to blast furnaces and owned by the ironmasters, and coke ovens situated at the colliery and controlled by the colliery owner. Division one does not concern the Gas Industry greatly, for the coke made is simply used for feeding the furnaces. The ovens are, in fact, ancillary plant in a self-contained unit. The activities of the "colliery" coke ovens are quite a different proposition in relation to our Industry as a producer of domestic solid smokeless fuel.

The position is that the colliery market for blast furnace coke is diminishing, while, at the same time, the production of coal slacks is increasing, due to the domestic consumer's tendency to abandon the use of highly priced lump coal and to employ in its place graded household coal and also to the growth in mechanical mining. The problem of profitably up-grading slack coal more than ever faces the colliery owner and coke oven manager; and it is with this problem that the authors deal. With diminishing sales in the blast furnace coke market, the coke oven industry will turn more and more to the domestic market as an outlet for its product. As a matter of fact, some coal owners, recognizing the inevitable trend towards smokelessness in the home, are already devoting the whole output of their coke oven plants to domestic coke. It is the domestic field, of course, for which the Gas Industry caters, and it is pertinent to consider our Industry's attitude towards this invasion into its preserves.

Our view on this matter is clear—that antagonism between the two industries will be disastrous for both; secondly, that there is no need for antagonism. We have heard quite a deal of complaint from the coke oven interests that the Gas Industry has no desire to foster co-operation. The Gas Industry—admittedly after years of neglect—has built up a domestic market for coke and is organizing coke distribution on a paying basis which is fair alike to producer, distributor, and consumer. Can our Industry be blamed for regarding with displeasure price-cutting incursions into this market? It seems obvious to us that pursuit of this policy by the coke oven industry cannot lead to co-operation, and equally obvious that there is no need for such a policy. Broadly speaking, we are organizing for domestic selling in the smokeless fuel market while with the coke oven industry—to its loss—it is a hit-or-miss haphazard affair. "It would seem futile," state Dr. Foxwell and Mr. Boon, "to anticipate the expansion of the industry in what are really strange markets unless an organization for extending and developing these markets is established and constituted to deal correspondingly with them. For marketing, if it is to be effective, must anticipate production as well as follow it. It must be organized as concerted and collective selling, operating under a well-directed and definite policy, as opposed to individual selling. Individual selling and the absence of concerted policy and action have probably done more damage to the coal industry in this country than has any loss of direct trade. . . . In the coming age of smokeless fuels do not let us make the blunder that has characterized the exploitation of our coal markets."

Organized Selling

WE would urge, not a bitter fight, but organization for sales within the coke oven industry, taking its cue from the experience of the London and Counties Coke Association of a policy of co-ordination and of promoting the use of coke as a domestic fuel. The potential field for smokeless fuels is vast enough for both the coke oven industry and our own Industry. There can be no doubt about that. But is it not a question of supplying a clamant market; the market must be created by conscious effort. Given that effort, increase in the demand for coke will grow apace. On the other hand, progress will be stultified if the line is followed of unrestricted production, ruthless competition, and speculative profits for intermediaries.

Our Industry, remark the authors, is beginning to look upon itself not only as a Gas Industry but as a fuel supplier. This view, we have maintained persistently, is essential to the full progress of the Industry. Good coke sales spell good gas sales. At present coke reduces the price of gas by between ½d. and 2d. per therm. Comparing our Industry with the coke oven industry we said that, broadly speaking, we are organizing for coke sales while the coke oven industry is not. That is true, but we are only beginning to see ourselves as a Fuel Industry. There would be an astonishing change—*and not at the expense of gas*—if as much attention was paid by us to the making, advertising, and marketing of solid smokeless fuel as we pay to the making, advertising, and marketing of gas.

As an Industry we seem to be frightened of entering wholeheartedly into the solid smokeless fuel field. In the domestic field alone the potential market is 30 or 40 million tons, and we are replying to the challenge by selling less than 7,000,000 tons. If there is profit in selling quality smokeless solid fuel—and we believe that there *is* profit—why are we not taking more active steps to expand our business? It is certain that someone will have to provide the solid smokeless fuel desired for domestic purposes.

Industrial Competition

In his Presidential Address to the Midland Junior Gas Association Mr. F. L. Atkin, of the Birmingham Gas Department, gives his opinion—based on a wide experience—as to what the Gas Industry has to face from electrical competition in the industrial heating field. Munition requirements during the War brought about a rapid extension of industrial gas sales. It was a period useful in that it introduced to the engineering and allied trades the advantages—now common knowledge—of gas as a fuel. On the other hand, gas furnaces had to be produced as quickly as possible to cope with the demand, and no blame can be attached to the manufacturers for putting out furnaces of crude construction, without insulation, and so on, which, however, were fully capable of meeting the requirements at the sacrifice of fuel economy. Moreover, such furnaces were low in first cost.

Electrical competitors have made capital out of these veteran furnaces. Out of necessity to produce workable furnaces they introduced equipment with insulation and automatic temperature control and compared these with the old simple types of gas furnace. In some cases the electric furnaces could compete in fuel cost with the gas furnaces which were relics of War days. The Gas Industry was not idle, of course, in developing automatically controlled gas furnaces having efficiencies double or treble their previous values, and modern gas furnaces are considerably cheaper to run than electric furnaces. Yet electric furnaces are being installed—due, Mr. Atkin says, to the appeal of the "press the button and it works" idea, and to the fact that electric furnace manufacturers have studied mechanical handling and conveying mechanisms and have woven these features into their furnaces in a very clever and practical way; they employ engineering designers who are skilled in mechanical handling as distinct from furnace design. Mr. Atkin asks the gas furnace manufacturers to consider this point very carefully.

Regarding the future, Mr. Atkin's suggestion is that an engineering design staff backed up by experts in the application of gas to the particular process under consideration at the moment should work in conjunction with experts to carry out the necessary experiments and tests, and he looks to the Joint Co-Ordinating Committee and the Centre Scheme to formulate such a scheme on a satisfactory basis. Co-operation of the manufacturer should be encouraged in such a scheme, and apparatus developed should be given the widest publicity. In brief, his view is that we should be in a position to quote and cater for a heat-treatment plant as a whole rather than to concentrate solely on the one aspect of the gas furnace which forms only part of the equipment. We should be able to anticipate the demand.

To our mind Mr. Atkin neither minimizes nor exaggerates the force of electrical competition. Due to lack of concerted effort in the Gas Industry electricity was enabled to find a footing where it never should have done. For many years after the War little or no attention was paid to the appearance of industrial gas appliances while the electricians were offering pleasant-looking equipment. The past two or three years, however, have witnessed a belated but a great change of attitude in our Industry. The Industrial Centres have already accomplished much, and they are organized to accomplish a great deal more. They have fostered co-operation between gas undertakings and makers of appliances and between both and the industrialists who install the appliances. Thermal efficiency has been vastly improved, automatic control has been developed, research into furnace atmospheres has widened the scope for gas usage, and at the same time the question of appearance has not been neglected. Success has attended the development of several pieces of apparatus, and the display of the British Gas Federation at the recent Shipping, Engineering, and Machinery Exhibition was to us a source of great encouragement. We are in complete agreement with Mr. Atkin, however, that our progress must be better revealed to the industrialist—that these developments need to be "put across" more effectively—and that, though the position for industrial gas heating is very sound, it "is not the time to rest on our oars."

Costing Systems

It is some time since Mr. Walter Grogono, of Croydon, in his Presidential Address to the Eastern Counties Gas Managers' Association, suggested that the Institution might to advantage consider the standardization of cost figures relating to the manufacture of gas. Different ideas on the allocation of costs to various units of plant lead to such complications as render the figures put forward practically useless for comparative purposes; and there is a great deal to be said for Mr. Grogono's contention that a standard system of costing should be introduced which would enable us to bring closer together not only the merits of the various methods of production, but also their relative costs.

On that occasion Mr. Grogono gave a brief outline of the costing system adopted at Croydon; a detailed account formed the subject of the Presidential Address of Mr. J. M. Webber to the London and Southern District Junior Gas Association on Friday last, and we hope that it will be the means of focussing attention on what is undeniably a question of growing importance in the successful running of gas-works plant. Mr. Webber rightly points out that the perfect costing system has yet to be found, and that with all costing systems the exercise of imagination must play a part. Unusual charges crop up and have to be dealt with. Above all, all such systems cost money, and if a scheme is taken beyond a reasonable completeness the cost becomes such that the method defeats its object—the saving of money, not elaboration for the sake of elaboration. The whole object of a costing scheme, he emphasizes, is to obtain information quickly. It is no use discovering at the end of a year that several thousand pounds have been needlessly spent on the works. The costing system is only justified if it makes this source of loss apparent at the end of a week or a month, so that prompt action can be taken. Market conditions fluctuate rapidly and plants have to be worked to suit the demands and prices for gas, coke, tar, oil, benzole, and so on, as well as the price of the raw material coal. The best results can only be obtained by the availability at short intervals of accurate costs of processes and material. A further aspect of a costing system, and not an unimportant one, is that the knowledge that costs are being investigated continuously tends to encourage economy in all departments, especially when credit is given for economical working so discovered.

The Croydon system, it will be obvious from Mr. Webber's detailed and helpful account, is a thorough one, and plays no small part in the formulation of works policy. There is one point about costing systems generally, however, which we would mention. Care must be taken to avoid the possible tendency to consider gas production—carbonization, condensation, exhausting, purification, and so on—as a number of separate departments in which the aim is always to reduce costs compared with the previous year. Gas production must be looked upon as a whole. Extra cost in one section is obviously justified if it is more than offset by saving in another section—if, that is, the cost of the therm into holder is reduced.

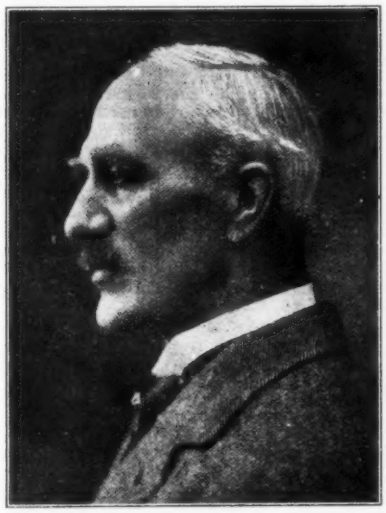
OBITUARY

Thomas Goulden.

In the sudden death last Friday of Mr. Thomas Goulden, M.Inst.C.E., M.Inst.Gas E., the Industry has lost a prominent engineer and an old friend. He was at the time of his passing a Director of both the Gas Light and Coke Company (since 1922) and the Tottenham and District Gas Company (since 1925).

Mr. Goulden, who was nearly 73 years of age, had been in failing health for some time, but he carried out his duties to the last. He had attended the Works and Products Committee on the day prior to his death and was, in fact, preparing to come to Westminster to a Court of Directors at the time of his fatal seizure.

Mr. Goulden spent the term of his pupilage with the late Mr. F. W. Hartley, with whom he was associated in most of his scientific work, and it was during that association that the progenitor of the calorimeter now perfected by Messrs. Alexander Wright & Co. was devised and constructed. The Methven screen was also worked out by Mr. Methven in conjunction with Mr. Hartley at this time. Subsequently Mr. Goulden served Messrs. Alexander Wright & Co. as assistant to Mr. Hartley. In 1884 he entered the service of the Gas Light and Coke Company as junior assistant at Beckton on the revision of the staff rendered necessary by the transfer of Mr. Trewby to Westminster. Mr. Goulden served under Mr. Beale and the late Mr. John Methven. On the decease of the latter in 1889 he succeeded to the responsibilities of Beckton. As incidents in the history of the Beckton works and of Mr.



A photograph of Mr. Goulden at the time of his Presidency of the Institution in 1921.

Goulden's professional work, it may be mentioned that in the year he first went to Beckton a commencement was made there with retort house machine work. The initiation of the first installation of carburetted water gas plant in this country was part of Mr. Goulden's work under the instruction of Mr. Trewby, and on its erection Mr. Goulden actually worked on the plant himself on both day and night shifts. During the period he was at Beckton the manufacturing capacity of the works was increased from 45 to 65 millions a day.

In 1904 Mr. Goulden succeeded to the Chief Engineership of the Gas Light and Coke Company upon the retirement of Mr. Trewby, a position he held until his elevation to the Board in 1922, when he was succeeded as Chief Engineer by Mr. Thomas Hardie. He was President of The Institution of Gas Engineers in 1921, while other prominent positions which he held in the Industry included Vice-Presidency of the British Commercial Gas Association in 1920 and Presidency of the Eastern Counties Gas Managers'

The interment took place on Tuesday.

Appreciations.

By the death of Thomas Goulden the Gas Industry has lost one of its most notable men. He entered the service of the Gas Light and Coke Company as an engineer in April, 1884, and, after having acted for some years as Station Engineer at Beckton, he became Chief Engineer in 1904. On his retirement from that position in 1922, he became a Director of the Company, a position he retained until his death.

He rendered the greatest possible assistance to the Company in its engineering work and in conjunction with the late Sir Corbet Woodall he brought the Company's Works to a high state of perfection which has been of the greatest value to the Company. I will, however, leave it to others to speak in detail of his technical work.

His engineering knowledge was second to none, and he was always receptive of new ideas and ready to give every fresh proposal his unbiassed consideration. He was a man absolutely free from prejudices and commanded the loyal support of his staff. He was particularly popular with the workmen who thoroughly appreciated his sincerity and fairness.

It is, however, as a man that we shall miss him most. His was a completely fearless character, and he had both great physical and moral courage. Although he could express his views forcibly, he always did so kindly. He could always be relied upon by his friends and his staunchness and loyalty were among his most striking characteristics.

Having been his colleague during all the years I have been connected with the Company, his death comes to me as a great personal loss, and the Gas Light and Coke Company has been deprived of one of its most useful Directors who was, in his time, one of its greatest engineers.

D. MILNE-WATSON.

May I be permitted to pay my tribute to Mr. Thomas Goulden? We knew each other nearly all our working lives and lately had been very closely associated at the Gas Light and Coke Company and Tottenham. He was a most thorough and first-class engineer—but it is the man we think of at this time. He earned the respect and admiration of everyone with whom he came in contact, and his sound judgment was always valued. His men loved him for his kindness, justice, and courage.

Not long ago we were talking of the first chapter of the Book of Joshua which we both enjoyed, and it seems to me that few men accepted the lesson there as he did. "Only be thou strong and very courageous" might well have been his motto. He will be greatly missed by many, but his high courage and character will long be remembered.

HENRY WOODALL.

The death of Mr. Thomas Goulden makes a change in the atmosphere of the Gas Light and Coke Company which all those directly connected with the Company are feeling very sadly to-day. He was associated with so much of what has been done and what is being done. He was so helpful and so sympathetic, so straightforward and so downright, so strong a disciplinarian and yet so kindly, and he was so closely in touch and so interested in all that took place that everyone to-day feels his loss a personal one.

He was with the Company during a period of great difficulty and his resourcefulness and energy were used to turn the fortunes of the Company into more satisfactory and profitable channels. He was exceedingly progressive; his mechanization of the works and his introduction of water gas resulted in large economies and greatly improved control in the manufacture of gas. No matter how difficult was the trouble or how complicated the problem, he was never turned aside; his determination to find a solution never wavered, and he only went more deeply and more thoroughly into the examination of it.

Mr. Goulden's long association with the Company and his wonderful memory were invaluable in coming to a conclusion on policy and future requirements. He was a sound counsellor and a progressive engineer, and was held in affection and esteem by Director, officer, and workman alike. I myself owe him much for his advice and support which have made my work easier and my position with the Company extremely happy.

THOMAS HARDIE.

* * *

We learn from a local correspondent that Mr. ROBERT BELL, Chairman of the Blyth Gas Company since 1930, died at Newcastle-on-Tyne on Oct. 17, aged 73. He had been a Director of the Company for 28 years.

* * *

The death took place on Oct. 16 at Cumnock of Mr. ROBERT STODDART, who was the sole surviving original Director of the Cumnock Gas Company, of which he was latterly Chairman. Mr. Stoddart was 86.

PERSONAL

Mr. G. H. STEWART, who has been Engineer and Works Manager of the Cannock District Gas Company, Ltd., for the last 16 years, is retiring at the end of the present year. He is to be succeeded by Mr. C. R. INGHAM, Engineer and Manager to the Brighouse Corporation, who will also act as Secretary of the Company.

Mr. Ingham has been at Brighouse since 1921, being promoted from Assistant Manager to Manager in 1923. During his managership at Brighouse the sales of gas in the area have increased by 50%.

* * *

The President of the Institution of Heating and Ventilating Engineers for the Session 1935-36 is Mr. ALBERT BELTON POTTERTON, who is well known to the Gas Industry as joint Managing Director of the Firm of Thomas Potterton (Heating Engineers), Ltd. Mr. Potterton has been a member of the Council of the Institution for many years, and was second and first Vice-President during 1934 and 1935 respectively. He is the elder son of the late Mr. Thomas Potterton, who was one of the foundation members of the Institution. A member of the Royal Sanitary Institute and a founder and Past Master of the Radiant Lodge of Freemasons No. 4,200, which was formed by members of the Institution, Mr. Potterton is also a Past Master of the Evening Star Lodge, No. 1,719.

* * *

The Directors of the Portsmouth Gas Company have elected Councillor FREDERICK BEDDOW, D.Sc., J.P., as Chairman of the Company, in succession to the late Mr. T. H. F. Lapthorn, J.P. Mr. THOMAS CARMICHAEL, M.Inst.C.E., the General Manager, has been elected to a seat on the Board, and also as Deputy Chairman, Mr. William Gillman, J.P., having intimated his desire to relinquish the Deputy Chairmanship. Mr. Gillman, however, will retain his seat on the Board.

Mr. Carmichael will, of course, continue as General Manager of the Company.

THE AUTUMN RESEARCH MEETING OF

The Institution of Gas Engineers

The following is the programme which has been arranged for the 7th Autumn Research Meeting of The Institution of Gas Engineers to be held on Nov. 5 and 6 at the Institution of Mechanical Engineers, Storey's Gate, St. James's, S.W. 1.

Tuesday, Nov. 5.

10 a.m. *Opening of 7th Autumn Research Meeting.*

1. Secretary (J. R. W. Alexander) to read the NOTICE convening the Special General Meeting of The Institution of Gas Engineers at The Institution of Mechanical Engineers, Storey's Gate, St. James' Park, London, S.W. 1.

2. To receive and discuss the 12TH REPORT OF THE GAS EDUCATION COMMITTEE; 1934-35. (*Communication No.* 119.)

3. To present DIPLOMAS IN GAS ENGINEERING (MANUFACTURE) for 1935 to:—
   Frederick Bell, B.Sc. (Liverpool), *2nd Class.*
   Albert Edward Haffner, Ph.D., D.I.C., A.R.C.S. (Ewell), *1st Class.*
   Alfred Harrison (Great Harwood), *2nd Class.*
   Louis Alfred Ross (Portsmouth), *1st Class.*
   William John Shelley (Hinckley), *2nd Class.*
   Cecil Rae Edwin Turner (Birmingham), *2nd Class.*

10.55 a.m.

4. To receive the 1ST REPORT OF THE RESEARCH EXECUTIVE COMMITTEE; 1934-35. (*Communication No.* 120.)
   This Report will be discussed under Agenda Item 15.

5. To receive the REPORT ON PROTECTIVE COATINGS FOR UNDERGROUND PIPES, by A. B. Densham, M.A., and F. C. Smith, Assoc.M.Inst.Gas E. (*Publication No.* 115.)

6. To receive the REPORT ON AIR VITIATION AND GAS APPLIANCES, by C. A. Masterman, M.A., M.I.Mech.E., F.I.C., E. W. B. Dunning, B.Sc., A.I.C., and A. B. Densham, M.A. (*Publication No.* 116.)

11 a.m.

7. To receive and discuss the 36TH REPORT OF THE JOINT RESEARCH COMMITTEE OF THE INSTITUTION AND LEEDS UNIVERSITY. Corrosion from Products of Combustion of Gas—Part III. Tube Experiments (continued). (*Communication No.* 121.)

11.45 a.m. to 12.30 p.m.

8. To receive and discuss the 37TH REPORT OF THE JOINT RESEARCH COMMITTEE OF THE INSTITUTION AND LEEDS UNIVERSITY. The Controlled Operation of a Carburetted Water Gas Plant—Part II. (*Communication No.* 122.)

Adjournment.

3 p.m.

9. To receive and discuss the 5TH REPORT OF THE LIQUOR EFFLUENTS AND AMMONIA COMMITTEE, embodying (1) Ammonium Bicarbonate, and (2) The Treatment of Gas Works Liquors in Admixture with Sewage. (*Communication No.* 123.)

3.45 to 4.30 p.m.

10. To receive and discuss the 26TH REPORT OF THE REFRACTORY MATERIALS JOINT COMMITTEE. (*Communication No.* 124.)

Adjournment.

Wednesday, Nov. 6.

10 a.m.

11. To receive and discuss the 1ST REPORT OF THE JOINT LIGHTING COMMITTEE; Investigation of the Factors Affecting the Performance of Gas Street Lamps. (*Communication No.* 125.)

11 a.m.

12. To receive and discuss the 1ST and 2ND REPORTS OF THE METERS COMMITTEE; The Institution of Gas Engineers' Specification for Gas Meters for Domestic Consumers. (*Communication No.* 126.)

11.45 a.m. to 12.30 p.m.

13. To receive and discuss the INSTITUTION GAS RESEARCH FELLOWSHIP REPORT; 1934-35. The Scaling of Mild Steel in Sulphur-Free and Sulphur-Containing Furnace Atmospheres, by H. C. Millett, Ph.D. (Research Fellow), and John W. Cobb, C.B.E., B.Sc., F.I.C. (Livesey Professor). (*Communication No.* 127.)

Adjournment.

2.30 p.m.

14. To receive and discuss the REPORT ON THE GENERATION OF HYDROGEN SULPHIDE IN WATER-SEALED GASHOLDERS, by The Gas Light and Coke Company and The South Metropolitan Gas Company. (*Publication No.* 117.)

3 p.m.

15. GENERAL DISCUSSION on (*a*) the 1st Report of the Research Executive Committee; 1934-35 (*Communication No.* 120) and (*b*) Gas Research and Investigation.

    This Discussion is intended (*a*) for the consideration of matters referred to in the 1st Report of the Research Executive Committee and not dealt with in the separately published Reports for which time for discussion has previously been provided during the Meeting, and (*b*) for the review and general discussion of, and the submission and consideration of proposals for Gas Research and Investigation and Technical Work.

4.15 to 4.30 p.m.

16. To receive a Report of the BALLOT for the election of Members, Associate Members, and Associates.

17. To report that the 73RD ANNUAL GENERAL MEETING will be held in London on 26th, 27th, 28th, and 29th May, 1936.

18. To report that the 8TH AUTUMN RESEARCH MEETING will be held in London on 3rd and 4th November, 1936.

19. VOTE OF THANKS.

The Institution of Gas Engineers

Report on the Generation of Hydrogen Sulphide in Water-Sealed Gasholders

(Publication No. 117.)

The Institution has published a "Report on the Generation of Hydrogen Sulphide in Water-Sealed Gasholders" by the Gas Light and Coke Company and the South Metropolitan Gas Company (Communication No. 117), copies of which can be obtained, price 1s. 6d. each, including postage, from the Secretary of the Institution.

Report on Air Vitiation and Gas Appliances

(Publication No. 116.)

The Institution of Gas Engineers has also published a "Report on Air Vitiation and Gas Appliances," by C. A. Masterman, M.A., M.I.Mech.E., F.I.C., E. W. B. Dunning, B.Sc., A.I.C., and A. B. Densham, M.A. (Communication No. 116), copies of which can be obtained, price 1s. 6d. each, including postage, from the Secretary of the Institution at 28, Grosvenor Gardens, London, S.W. 1.

This Report expands the scope of the Report on the Combustion Standards of Gas Appliances, Communication No. 41 of The Institution of Gas Engineers. In that Report the same authors reviewed the normal and abnormal products of combustion from various types of gas appliances in respect of their causes and physiological effects.

The present Report reviews possible causes of air vitiation due to gas appliances in a more general way, including possible nuisance from smell, as well as expanding the work on possible hazard to health and referring the whole to practical conditions in occupied rooms.

In the Introduction the authors define vitiation of the air.

The smell of excessive concentration of products of combustion is attributed in Section I. to sulphur oxides, for which a permissible limit of 0·0001% is derived. The maximum imperceptible concentration of products therefore depends *inter alia* directly upon the sulphur content of the unburnt gas.

The effect of air vitiation upon combustion is referred to in Section II., and a number of characteristic curves are given showing how different gas appliances are affected as vitiation increases. Provided the appliances are not themselves defective or operated at an excessive gas rate, combustion remains unprejudiced in all cases up to a vitiation corresponding to more than 1% carbon dioxide, and in many appliances up to much higher limits far beyond those at which matches, &c., can be burned.

As a result of previous work and further tests now reported, a generalization is attempted in Section III. on the degree of ventilation to be expected in normal occupied rooms. A number of practical conditions greatly influence the results, but an air change of under 1 per hour is found to be unusual. A more normal figure, with windows shut and no flue operating, is about 2 air changes per hour.

The conclusions derived in Section IV. are summarized in a Table showing the limiting gas rate for continuously or intermittently operated appliances without flues up to which limit no nuisance (or hazard to health) will result.

It is appreciated that resulting conditions may depend upon such factors as the degree of absorption of sulphur oxides by the walls of the room and by the relative proportions of sulphur dioxide and sulphur trioxide, but broadly speaking for a gas containing 20 grains of sulphur per 100 cu.ft. the maximum imperceptible gas rate for continuously burning flueless appliances is about 12 cu.ft. of gas per hour per 1,000 cu.ft. of room capacity, with an air change of 2 per hour. Where, as may be more frequent, the appliances are operating intermittently, similar limiting conditions are consistent with higher gas rate amounting, for example, to 30 cu.ft. per hour per 1,000 cu.ft. of room capacity for appliances operating for 15 minutes only at a time (intermediate standby period not less than 1 hour). These limits depend upon perceptibility of sulphur oxides and will be proportionately increased or decreased according to the sulphur content of the gas. Disregard of these limits may lead to discomfort due to pungent smell or, in the case of heating appliances, to overheating but will not inevitably involve danger to the occupants of the room. Possibility of danger or hazard to health appears able to arise only if there is a gas leakage or bad combustion in the appliance, both of which possibilities can and must be prevented whatever be the circumstances of use of the appliance.

It is shown that although by the injudicious use of flueless gas appliances a nuisance due to the smell of products of combustion can be created, this nuisance is readily avoidable by consideration of the room capacity and degree of ventilation outlined in the Report. Appendices 1, 2, and 3 have reference to Sections I., II., and III. respectively and refer in detail to the experimental methods used and the results obtained.

Forthcoming Engagements

Oct.

25.—Gas Companies' Protection Association.—Committee Meeting, 2.30 p.m.

26.—Western Junior Association.—Meeting at Bristol. Paper by Dr. F. J. Dent, I.G.E. Research Chemist.

26.—Yorkshire Junior Association.—Annual Meeting at Leeds. Address by Mr. H. Burton, of Shipley.

28.—London and Counties Coke Association.—Fourth Annual General Meeting, Hotel Metropole, London, 3 p.m.

29.—B.C.G.A.—Eastern District Conference at Peterborough.

Nov.

5.—I.G.E.—Council, 9.30 a.m.; Council, 4.30 p.m.

5 and 6.—I.G.E.—7th Autumn Research Meeting at The Institution of Mechanical Engineers, Storey's Gate, St. James' Park, S.W. 1.

6.—Manchester and District Junior Association.—Visit to Prescot. Paper by Mr. F. N. Booth and Mr. J. Fletcher.

7.—S.B.G.I.—Council Meeting, 11 a.m., followed by the Autumn General Meeting.

7.—Midland Junior Association.—Meeting. Paper by Mr. R. G. Marsh.

12.—I.G.E.—Gas Education Executive Committee, 4 p.m.

14.—Midland Association.—Autumn General Meeting, Grand Hotel, Birmingham.

14.—Southern Association (Eastern District).—Meeting at 28, Grosvenor Gardens, S.W. 1.

15.—London and Southern Junior Association.—Annual Dinner.

16.—Yorkshire Junior Association.—Meeting at Shipley. Presidential Address of Mr. J. W. Carlton.

16.—Western Junior Association.—Meeting at Exeter. Paper by Dr. C. M. Cawley, of the Fuel Research Department.

19.—I.G.E.—Session at the 8th Public Works, Roads and Transport Congress and Exhibition, Royal Agricultural Hall, London, N. 1, 3 p.m.

22.—London and Southern Junior Association.—Meeting. Paper by Mr. W. Grogono, of Croydon.

29.—I.G.E.—Liquor Effluents and Ammonia Committee, 11.15 a.m.; Joint Research Committee, 2.30 p.m.

30.—North of England G.M.A. (Auxiliary Section).—Meeting at Newcastle-on-Tyne and Paper by Mr. D. Yule.

Dec.

3.—I.G.E.—Research Executive Committee, 2.30 p.m.

4.—Manchester and District Junior Association.—Visit to Birkenhead. Paper by Mr. A. J. Walker.

5.—Midland Junior Association.—Annual Dinner.

11.—B.G.F.—1st Annual General Meeting, Grosvenor House, Park Lane, London, W. 1, 3 p.m.; 2nd Annual Dinner, Grosvenor House, Park Lane, London, W. 1, 7 p.m.

13.—London and Southern Junior Association.—Paper by Mr. L. Friedman, of Ascot Gas Water Heaters, Ltd.

14.—Scottish Western Junior Association.—Meeting and Address by Mr. W. D. Rowe, of the B.C.G.A.

14.—Western Junior Association.—Meeting at Torquay. Paper by Mr. J. W. Denton, of Torquay.

21.—Scottish Western Junior Association.—Annual Social.

News in Brief

Electricity Failed over a wide area of South Yorkshire on Sunday night, Oct. 13, for about an hour.

Applications are Invited for the position of General Manager to the Shotley Bridge and Consett District Gas Company.

A Flat Rate Reduction of 2½d. per 1,000 cu.ft. for gas in Markinch will, it is understood, be introduced as from Jan. 1, 1936.

The Price of Gas at Lockerbie has been reduced by 2d. per 1,000 cu.ft., now making it 4s. The reduction takes effect on Nov. 1.

Gas Was Chosen by 7 Votes to 3 to light the streets of the Mid-Craigie housing estate by the Dundee Police and Lighting Committee.

Application for a Special Order under the Gas Undertakings Acts 1920 to 1934, is intended to be made by the Midsomer Norton Gas Company, Ltd., to the Board of Trade with the object *inter alia* of extending the existing limits of supply.

A Special Order is being sought by the North Middlesex Gas Company under the Gas Undertakings Acts 1920 to 1934, one of the objects of which is to authorize the Company to raise additional capital by the issue of consolidated or preference stock.

Among the Objects of a Special Order for which the Southgate and District Gas Company are applying to the Board of Trade under the Gas Undertakings Acts 1920 to 1934, is the authorizing of the Company to raise additional capital by the issue of consolidated or preference stock.

The Position of Manager and Engineer is vacant at Stirling, and the Company invite applications for the position to which a commencing salary of £500 per annum is attached together with free house, coal, and gas. Further particulars will be found in our advertisement columns this week.

A Gasholder is to be Erected at Ballymena having a capacity of 60,000 cu.ft. in place of the present one which has already exceeded its useful life. The Council, who own the Gas Undertaking, recently approved the recommendation that the work should be carried out at a cost of £2,200.

A Fittings Superintendent and Showrooms Manager is required by the Bradford Gas Department at a salary of £465 per annum rising (subject to satisfactory service) by annual increments of £15 to a maximum of £510 per annum. Details of the position will be found in the advertisement columns of this issue.

An Exhibition of Gas Appliances was held under the auspices of Kilmarnock Gas Committee in the Lower Art Hall, Kilmarnock, from Oct. 14 to 19. The opening ceremony was performed by Treasurer Carnie. Mr. J. W. McLusky, Engineer and General Manager of the Glasgow Gas Department, addressed the company.

Reduced Charges for Gas are being put into operation by the Motherwell Gas Department as from the November survey. The new charges are: Ordinary consumers, 9·412d. per therm for first 17 therms and 8·824d. thereafter; and prepayment consumers, 10·588d. per therm for first 17 therms and all in excess at 10d. per therm.

Gas Cookers and Wash Boilers to the number of 240 are to be installed in each house of what was to be an all-electric estate at Denton. This very satisfactory change has been brought about by the good work of the Engineer and Manager of the Gas Department, Mr. H. C. Handley, who informs us also that a further 200 houses of the same type are to be built.

Very Generous Contributions have been made by the employees of Messrs. Alder & Mackay, Ltd., to Edinburgh charities during the year ended Sept. 30 last, and under the scheme of weekly contributions the following payments have been made: Edinburgh Royal Infirmary £132 6s. 4d., Royal Hospital for Sick Children £50 4s. 5d., and Queen's Institute of District Nursing £46 7s. 8d.

First and Third Prizes Were Won by the Plymouth and Stonehouse Gas Light and Coke Company in the "Things for Service" class of the Shop Window Display Competition held recently in connection with the City's Eighth Shopping Festival Week. Out of a possible 100, the Company secured 89 points with a display of geysers, being only one point behind the winner of the Challenge Cup. The third prize was awarded for a display of gas cookers.

A Reduction of 10d. per 1,000 Cu.Ft. in the price of gas was approved by the Inverbervie Town Council on Oct. 14. The Convener of the Gas Committee, Bailie Blease, submitted a report which showed that 3,269,700 cu.ft. of gas had been manufactured by the Council's Gas Undertaking during the year, and 2,807,400 cu.ft. had been consumed. The income from the Undertaking was £933 against £988 last year. The price of gas is now 5s. 10d. per 1,000 cu.ft.

An Increased Dividend was declared at the Annual Meeting of the Spilsby Gas Company, held on Oct. 12 and presided over by Mr. J. R. Walker. The balance-sheet, which was adopted, showed an increased profit on the year's working and the recommendation of the Directors that the dividend should be increased from 2½% to 3%, free of tax, was unanimously adopted. It was stated that a larger dividend could have been paid but it was considered wise to add to the reserve fund.

But There Was No Light!—A special service was arranged at the Uttoxeter Parish Church on Sunday evening, Oct. 13, for the ceremony of "Blessing the Light," in connection with the recent installation of electricity in the church, but by the irony of fate the system failed before the ceremony could be performed. A large congregation had assembled, and just as the clergy and choir were about to leave the vestry for the chancel at 6.30 the church was suddenly plunged into darkness, due to the overloading of a fuse. By candle light the Vicar delivered his address on the subject of "Light as the Symbol of Christian Character." After 20 minutes or so the light was restored and the service proceeded.

The British Gas Federation

New Date of Annual General Meeting and Dinner

Owing to General Election considerations the First Annual General Meeting and the Second Annual Dinner of The British Gas Federation have been postponed from Nov. 4 to Wednesday, Dec. 11, at Grosvenor House, Park Lane, London, W. 1, at 3 p.m. and 7 p.m. respectively.

National Gas Council

The following communication has been received from Mr. J. W. Napier:—

Appointment of Resident Officer in Scotland.

The proposal of the Scottish Executive Board, made almost a year ago, for the establishment of an office in Scotland, and the appointment of a Resident Officer, has been authorized by the National Bodies, and after long delay has now been finally arranged. The maintenance of the Scottish Office will be met out of national funds. The office will be situated at 154, West George Street, Glasgow, and Mr. J. C. Walker, of the British Commercial Gas Association, has been appointed to the office to try out the work, and to report in three to four months' time. Mr. Walker's appointment is temporary, and he will continue to be attached to the Headquarters Staff in London. His duties will comprise the work of the National Gas Council, British Commercial Gas Association, Federation of Gas Employers, Regional Gas Council, and the Scottish Industrial Gas Development Centre. It is proposed that at the next Annual Meeting of representatives in Scotland of the National Bodies in May, 1936, members will be invited to discuss the position, when the whole question of the appointment will be considered afresh and a decision taken.

All communications from Scottish gas undertakings dealing with the work of the National Bodies above stated should now be addressed to Mr. J. C. Walker, National Gas Council, 154, West George Street, Glasgow, instead of to Mr. J. W. Napier, Alloa.

The Society of British Gas Industries

The Industry will be interested to note that at the Autumn Meeting of the Society on Nov. 7 the thirtieth anniversary of its formation will be celebrated.

In the absence of the President, Sir John Cadman, G.C.M.G., D.Sc., the Chair will be taken by Mr. Charles Clare, who is Senior Vice-President. It is singularly appropriate that Mr. Clare should preside on this anniversary occasion since it was he who was responsible with one or

two friends for bringing the Society into being in 1905, and Mr. Clare was its Chairman during the first four years of its existence.

We have little doubt that his very many friends will unite on this occasion to show their appreciation of Mr. Clare's conspicuous services to the Society and, through it, to the whole Industry.

Amalgamation and Grouping

Derby and Langley Mill.

The application of the Derby Gas Light and Coke Company for a Special Order authorizing the absorption of the Langley Mill and Heanor Gas Light and Coke Company received official sanction on Aug. 2 last. The Derby Company have issued £89,890 of 5% preference stock to the shareholders of the Langley Mill Company, which will enable them to receive the same returns on the original capital.

United Kingdom and Runcorn.

We learn from a local correspondent that the control of the Runcorn Gas Company has passed into the hands of the United Kingdom Gas Corporation, Ltd., which recently made an offer to purchase shares in the capital of the Company. A condition of the negotiations was that holders of 51% of the issued ordinary share capital of the Company should be prepared to accept the offer. Acceptances were received in respect of 90% of the shareholders.

Midland Junior Gas Association

Visit to the Dibdale Works of Gibbons Bros., Ltd.

By courtesy of the Directors of Messrs. Gibbons Bros., Ltd., a visit was paid to the Dibdale Works of the Company by over ninety members of the Midland Junior Gas Association on Oct. 19.

The Dibdale Works of Gibbons (Dudley), Ltd., are situated at Lower Gornal, near Dudley, and occupy an area of approximately 30 acres. Among the main products at this works are the following: Hand and machine made firebricks and special shapes, made in standard grades, also in special mixtures for specific requirements, siliceous bricks and shapes, and gas retorts made in siliceous and fireclay qualities.

The annual output of small bricks is 7,000,000, large bricks 4,000 tons, and approximately 40,000 ft. of retorts. The manufacture of silica bricks, segmental retorts, coke oven shapes, &c., is carried on at branch works situated in Pensnett, some two miles from the main works.

A mining area of approximately 200 acres is owned by the Company, being worked at two pits. Over 35,000 tons of clays and 20,000 tons of coal are mined yearly.

After careful selection at the mine, the raw clay is tipped into a jaw crusher and is then automatically fed into a high speed perforated bottom grinding pan. The ground material is passed over electric vibrating screens, and thence into large storage hoppers. Automatic feeders take clay and grog from the hoppers in the correct proportions, and deposit them, via a conveyor, into a vertical "pugging" machine, and thence into the brickmaking machine.

Raw materials for retorts are ground, screened, and stored in hoppers, carefully measured in the correct proportions, and tempered in a solid bottom roller mill.

A gas-fired tunnel kiln with separate pressure producers is 300 ft. long and has a weekly output of 275 tons. Maximum firing temperature is 1,450° C. the temperatures at various points in the kiln being recorded by thermocouples and pyrometers. Twenty intermittent kilns are all of the coal-fired down-draught type. The mould making department is equipped with the latest type woodworking machinery. The existing laboratory having been burned down early in the year, a new building is now nearing completion. Routine tests are made on all raw materials and finished products, and in addition a large amount of research work is done. Tests carried out include complete chemical analyses, refractoriness with and without load, after expansion and contraction, porosity, permeability, sieve analyses, spalling, slag resistance, thermal conductivity, &c.

The machine and fitting shops of the companion firm of Gibbons Bros., Ltd., are situated adjacent to the firebrick works and a certain amount of light plating work is already carried out here. The heavy structural shops are at Corbyns Hall approximately 2 miles away on the G.W.R. Branch from Brettell Lane to Wolverhampton. These were erected in 1921 and have a capacity of 700 tons a month of finished steelwork.

The visitors were afterwards entertained to tea, and a vote of thanks for the very useful and interesting visit was proposed by the President, Mr. F. L. Atkin, and seconded by Mr. F. A. Jenkins, Senior Vice-President. In responding, Mr. Allen, Director of Messrs. Gibbons (Dudley), Ltd., mentioned that the Dibdale Works were applying gas to a growing number of processes and an approximate estimate of use to-day would be 5,000,000 cu.ft. per day, and about 100,000 tons of coke were used in a year.

West of Scotland Gas Grid

Appointment of Committee of Six

On Oct. 15 the Board of Trade announced that the Commissioner for the Special Areas in Scotland in his recent report recommended the appointment of a Committee to consider certain questions relating to the development of gas production and supply in the West of Scotland.

The President of the Board of Trade, after consultation with the Secretary of State for Scotland, has now appointed a Committee with the following terms of reference: "To consider the possibility of co-ordinating the manufacture and distribution of gas in the West of Scotland and to make recommendations."

The members of the Committee are:

Sir Alexander Walker, K.B.E. (Chairman).
Mr. T. H. Thorneycroft.
Mr. R. Bryce Walker.
Mr. J. Jamieson.
Mr. P. J. Dollan.
Mr. G. Evetts.

The Secretary of the Committee is Mr. F. J. Coleman, M.B.E., Mines Department, Dean Stanley Street, S.W. 1.

British Commercial Gas Association

Midlands District Conference at Wolverhampton

The Midlands District Conference of the B.C.G.A. was held at Wolverhampton on Thursday, Oct. 17, at the Victoria Hotel, under the Presidency of Mr. A. B. Hanbury-Sparrow, J.P., Chairman of the Wolverhampton Gas Company.

The delegates were welcomed by the Mayor of Wolverhampton, Councillor Morris Christopher, J.P. Addresses were then delivered by the President of the Conference and Mr. Wallace Smith, General Manager, Estates Department, Birmingham, on "Housing."

"Rehousing the poor has been a national 'bogey' as long as I can remember," he said. "It has been the main axiom of the politician and is still likely to be so, until something of a more important character appears in the Political Arena." Birmingham was, he imagined, one of the pioneer cities to deal with an area where housing conditions were bad, coupled with which existed the inevitable crime, disease, and mortality.

So recently as 1929, Mr. Smith continued, the Gas Committee of Birmingham made special arrangements for carcassing with gas and providing gas cookers and gas lighting in no less than 26,000 court and terrace houses which up to that time had no such facilities. The appreciation of this effort was very marked; in fact, the story was told that to celebrate the installation of gas several of the courts held beanfeasts and had all the lights on in the daytime! The 1930 Housing Act was introduced to eradicate the slums. The programme of Birmingham was to demolish 10,000 such hovels in five years, which period expired in 1938. That would involve the erection of some 12,500 dwellings to accommodate the families to be displaced from clearance areas.

One of the important facts, the speaker continued, which could not be stressed too often, was the necessity for a cleaner atmosphere in our cities.

It was commonly supposed that factory chimneys were responsible for most of the damage done by smoke, but according to the best authorities three-fourths of the damage was caused by domestic chimneys. In Birmingham the 42,000 Municipal houses which had been erected were all using gas. He saw no reason why gas engineers and housing managers should not co-operate and introduce to the householder higher education in regard to the preparation of everyday family meals.

At the Women's Session, the Mayoress, Mrs. Morris Christopher, in the chair, Mrs. Eileen Murphy, Home Service Director, B.C.G.A., gave her address on "Modern Home Making."

"Men should be grateful for women's discontent, for

most of the improvements in modern life have been caused by the dissatisfaction of women," she said. To-day women were dissatisfied with the smoke-nuisance. Nobody liked coal-smoke, said Mrs. Murphy, women least of all. Anyone who had lived in a manufacturing town knew how smoke laid its dirty fingers on everything—curtains and covers and clothes included. A calculation had shown that a fastidious housewife in Manchester would have to spend half as much again on laundry as she would spend in Harrogate. Coal-smoke was a kind of poison in the air. Everyone knew the effects of smoke on buildings. First it begrimed the stone, then it made the masonry decay. It cost the Government thousands of pounds every year to repair the damage caused by smoke on public buildings alone. If smoke could produce such an effect on bricks and mortar, asked Mrs. Murphy, what effect was it going to have on human lungs? Those evils could be avoided in great part by using modern fuels. The use of smokeless fuels like gas and coke would help to save us, our children, and other people's children from ill-health.

Everybody who used gas was helping to keep miners at work. The Gas Industry gave employment to 70,000 British miners because it used only British coal.

New Works Canteen

Progress of George Wilson Gas Meters, Ltd.

The Mayor of Coventry (Alderman T. E. Friswell) on Oct. 9 declared open the new canteen provided for their 500 employees by George Wilson Gas Meters, Ltd., Foleshill Road.

The site of the canteen was formerly occupied by a store shed. It has accommodation for some hundreds of persons for meals. At one end of the canteen is a permanent stage. Mr. J. H. Wilson, Managing Director, welcomed the guests, and pointed out that the Company commenced production in 1904 with two men, but to-day employed about 500 people.

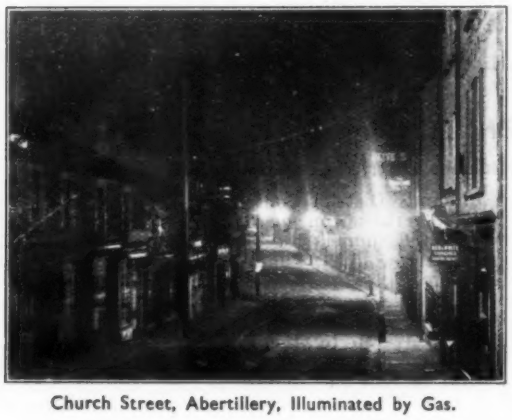
The Mayor said he was pleased to be present, for one reason because of the firm's considerate attitude towards their employees.

Captain W. F. Strickland, M.P., congratulated the firm on its progressive move in providing the canteen. People had said that the day of gas had gone, but their Company provided the answer.

Mr. F. C. Wilson thanked the Mayor for coming to open the canteen and Captain Strickland for his presence and address. At an informal dinner to the guests in the Company's offices which followed, Aldermen C. Payne and W. H. Batchelor thanked the management for their hospitality, and Mr. Derrick Wilson expressed the firm's pleasure at the presence of the guests. Among others present were Councillor G. E. Roberts (Chairman of the Gas Committee), Councillor G. Hodgkinson (Vice-Chairman), Mr. P. N. Langford (Manager of the Gas Department), Mr. J. Taylor (Development Officer), Mrs. G. H. Wilson, Mrs. D. Wilson, Mr. D. Poole (Director), Miss Sisum (Director), and Mr. A. C. Frost (London Manager).

Gas Activities in South Wales

Novel Slogan Competition at Abertillery



Church Street, Abertillery, Illuminated by Gas.

The Gas Department has been active in Abertillery during the past few weeks, particularly in connection with the local Shopping Week.

Last year Mr. H. Maycock, the Engineer and Manager, concentrated upon floodlighting; and by way of a change this year he based his displays upon topics of local interest, particularly the forthcoming visit of the All Blacks. In the gas showroom window were various national and international rugby football jerseys, caps, and blazers, and by adjusting several Rugby terms to the use of gas he stimulated interest in a slogan competition to assist the Department's publicity campaign. More than two thousand entry forms for this competition were issued, resulting in business beyond all expectation.

Many interesting slogans were received, and the following were the prizewinners:

1st (enamelled gas cooker).—G. Morgan, 14, Argyle Street, for

" Never absent—Never late—GAS."

2nd (enamelled gas cooker).—L. Thomas, 45, Granville Street, for

" Gas In Every Room—Reduces Coalfields Gloom."

3rd (5-radiant gas fire).—C. Lane, 35, Victoria Street, for

" Gas Ensures a Smooth-Running Home."

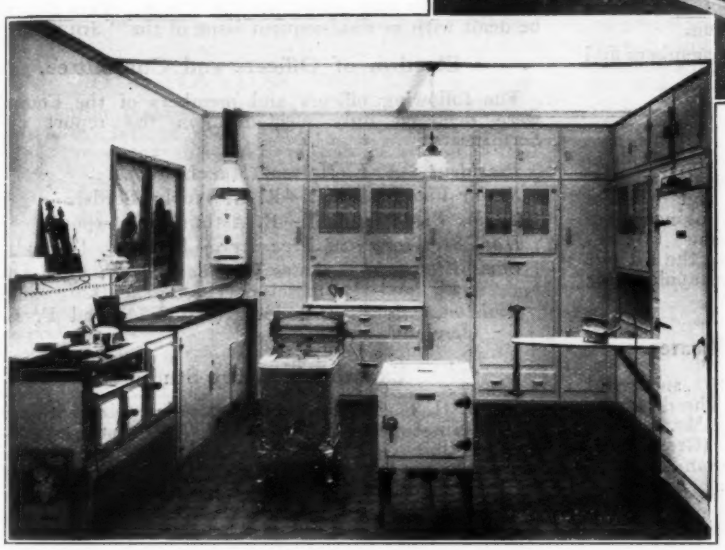
A portable heater was awarded to the competitor whose slogan was

" Every woman's man—Mr. Therm."

The accompanying photographs, kindly sent by Mr. Maycock, show Church Street illuminated with Sugg's 10-light " Rochester " lamps; and also a view of the Department's decorated lorry display.

A Decorated Lorry Display.

Joint Gas and Electricity Exhibition at Shipley



Two views of the gas section at the Shipley Exhibition. Above a glimpse of the gas fire display, and, left, an attractive all-gas model kitchen, fully equipped with all the latest labour-saving appliances.

An Exhibition under unusual circumstances was held recently at Shipley, Yorkshire. It was styled a "Modern Homes" Exhibition and was organized by the Gas and Electricity Departments of the Shipley U.D.C. The rival services were thus brought face to face and presented to the public for their enlightenment and for their assessment of respective values. From the Gas Department's point of view the venture has been a huge success. Mr. H. Burton (the Gas Engineer) is advocating gas as being the better service even regardless of cost. This was the keynote of the whole of a splendid exhibit which aroused tremendous local interest.

First of all the whole of the appliances chosen for the King's Jubilee House were displayed in working order on a stand backed by a mural painting 22 ft. long of the King's House. The cooker in blue and chromium plate was given a special setting, the display being kindly loaned by the Parkinson Stove Company.

This was followed up by the all-gas model rooms, a furnishing firm in the district being commissioned to furnish the dining room and lounge with modern furniture, panel gas fires being fitted and modern gas lighting fixtures. The "all-gas" kitchen was another attraction, being completely fitted with "Peerless" kitchen cabinets in Jubilee blue and silver. These fittings again tied up with the King's House as being the fitments chosen. The gas appliances, all fixed and working, included a "New World" range, Dean's washing machine, "Ascot" multi-point water heater, clothes drying cabinet, plug-in gas iron, "Freezolux" refrigerator, and switch-controlled lighting. Washing demonstrations were continuously carried on in this perfect kitchen, and a continuous stream of people examined the equipment closely.

A bathroom was constructed, lined with Vitrolite glass tiles in colours similar to those used in a bathroom in the King's House. Instantaneous water heaters of various types were displayed in action at the entrance to the bathroom, which was also fitted with geyser, gas-heated towel rail, clinical lamp, and chromium finished gas brackets and switch-controlled pendant.

The remaining space was utilized as a general appliance stand, the background being designed by the B.C.G.A. Display Department with the message "In your new home use Gas." A tiled recess was also constructed showing the desirable position for fixing a gas cooker and coke-fired boiler. This recess was also illuminated by a concealed gas burner.

The great interest displayed by the public was shown in the gas and electric cookery demonstrations which were held in a separate room on alternate days. The gas cooking demonstrations were so packed that large numbers were unable to obtain admission.

While a Joint Exhibition of this nature certainly proved to be a greater attraction to the public than one organized by either Department individually, Mr. Burton feels that there is an element of danger to the Gas Department from the following point of view. It may be accepted as a fact that the Electricity Department hunts for new consumers among the existing gas consumers, and the more the Gas Department attracts the public to the joint exhibition the more gas consumers are present to be tempted by the electricity salesmen. It is essential therefore that the gas exhibit be such that there is no doubt in the consumer's mind about gas being the better service. On the other hand, a joint exhibition practically amounts to a veiled challenge and urges one to put forth a greater effort than one would under normal circumstances.

Recognizing the importance of the occasion locally, Mr. Burton consulted the B.C.G.A. and acknowledges their valuable assistance in planning the layout.

Manchester District Association of Gas Engineers

The Autumn General Meeting was held at the Midland Hotel, Manchester, on Friday, Oct. 18, the PRESIDENT (Mr. A. L. Jennings, Spenborough) in the chair.

The PRESIDENT, in opening the proceedings, remarked that the attendance at the meeting and at the luncheon which preceded it was very nearly a record. This was very gratifying in view of the fact that the Council had called attention to the fact that the attendance at some of the meetings and functions was not all that was to be desired. He hoped it would be as good or better in the future. All the members would join him in welcoming Col. W. M. Carr, the President of The Institution of Gas Engineers.

Mr. J. H. RACE (Farnworth) and Mr. A. ALLEN (Droylsden) were appointed scrutineers of the ballot papers for the election of the officers of the Association.

Apologies for absence were announced from members and officers of kindred Associations.

New Members.

The following were inducted as Members of the Association: Mr. D. T. Livesey (Engineer and General Manager, Doncaster); Mr. T. Haworth (Engineer and General Manager, Darwen); and Mr. F. A. West (Engineer and Manager, Altrincham). Mr. D. M. Henshaw (W. C. Holmes & Co., Ltd., Huddersfield) was also on the list but was unable to be present and sent a letter of apology for his absence.

Presentation of Examination Certificates.

The PRESIDENT presented certificates to successful students in the higher grade examinations. The diplomas in Gas Engineering (Manufacture) gained by Mr. F. Bell (Liverpool) 2nd class and Mr. A. Harrison (Great Harwood) 2nd class will be presented at the Autumn Research Meeting of The Institution of Gas Engineers.

Higher Grade Gas Engineering (External Candidates).

J. A. Speers	Preston	1st Class
G. E. Burkill	Crewe	2nd Class
A. G. Hartley	Blackpool	,,
J. L. Wilson	Kendal	,,

Higher Grade Gas Supply (External Candidates).

R. Hayes	Leyland	2nd Class
C. W. Hemingway	Featherstone	,,

Higher Grade Gas Engineering (Internal Candidates).

R. Bairstow	Prestatyn	2nd Class
S. E. Balsom	Wrexham	,,
E. Bates	Stalybridge	,,
C. J. Dougherty	Leeds	,,
R. V. Hart	Bolton	,,
R. K. Law	Marple Bridge	,,
H. Millington	Birkenhead	,,
C. H. Rickard	Leeds	,,

Higher Grade Gas Supply (Internal Candidates).

F. Roberts	Bradford	1st Class
G. Gilden	Timperley	2nd Class
S. H. Stokes	Elland	,,
J. B. Walsh	Altrincham	,,

The PRESIDENT said last year 49 students took the higher grade examinations; this year there were 18. He hoped this reduction did not mean that the students were not taking the examinations seriously but was due to the students being engaged in ancillary subjects which would lead up to the higher grade certificates in the coming years. Reports of the examiners had appeared in the Technical Press, and it was stated that a large number of students apparently had not found time to answer the requisite number of questions. This was of fundamental importance; in future examinations the students should make a special point of endeavouring to answer the required number of questions. They would serve their interests very much better if they replied to all and made their answers more concise. A Junior who was concise in his statements to his chief and could elucidate them by a quick sketch was a very useful man. The standard of work generally was better than in previous years. Like everyone else students were not perfect; the examiners had pointed out pitfalls into which they fell, and the students would be well advised if they considered what the examiners had said. It is very gratifying to find that out of six diplomas for the whole country two had gone to the Manchester District. He conveyed to the successful students the congratulations of the Council and the members.

Mr. C. Bateman (Engineer and General Manager of the Harrogate Gas Company) then read a Paper entitled "Meeting Present-Day Conditions." It was illustrated with lantern slides, and a talking film used for advertising purposes was also shown on the screen. This Paper will be dealt with in a subsequent issue of the "JOURNAL."

Election of Officers and Committee.

The following officers and members of the Committee were declared duly elected upon the report of the Scrutineers:

President.—A. L. Holton (Manchester).
Senior Vice-President.—R. N. Webb (Leeds).
Junior Vice-President.—E. Astbury (Liverpool).
Hon. Secretary and Treasurer.—J. Bridge (Elland).
Committee.—A. F. Ames (Burnley), T. R. Cook (Blackpool), and H. Singleton (Huddersfield).
Auditors.—R. B. Braddock (Radcliffe) and F. Elliott (Leyland.

Examinations for Students.

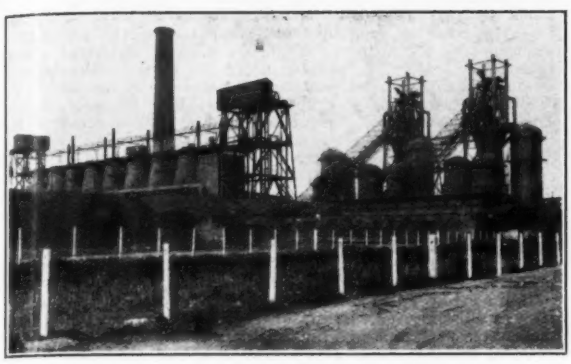
Mr. J. H. CLEGG (Southport) raised a point with respect to examinations for students. The last presentation showed that only two first-class certificates had been awarded. He had in mind two students in two towns one of whom had gone through every ancillary examination with flying colours and had received Honours. He had passed the examination of The Institution of Gas Engineers and the National Institute of Chemistry, and had sat four times for his examination as Gas Engineer without being able to obtain more than a second-class pass. He had answered every question that had been asked, and he had known the subjects of the questions inside out. The result was that he was discouraged. Another student had also sat four times for his first-class certificate. Both these students were reaching the age of 27 years, and therefore it was a serious matter from their point of view. He, the speaker, would be glad if those members who were connected with the Examination Scheme would give some consideration to the point.

The PRESIDENT said he had stressed the point in the Council meeting that the education of students in the Gas Industry required simplification as much as possible, and that examinations should be so arranged as to find out how much a student knew and not how little. The Report of the Examiners would be considered at the meeting of The Institution of Gas Engineers in London, and it would be possible to raise the point there.

Col. W. M. CARR (Stretford) observed that while there were not many first-class passes it must be remembered that the standard had been raised, and rightly so, within the last year or two. He felt that the Examiners, as a whole, adopted a very fair attitude. Many students did not show at their best in an examination, and it might very well be that a student who only secured a second-class certificate might prove to be, in his actual work, a better man than one who had obtained a first-class certificate. To his mind the mere fact that a student had gained a Certificate was good enough in the majority of cases because the standard was high. He suggested that they must be very careful, as an Association, in regard to suggesting any lowering of the standard in view of the present-day greater demands upon the members of the gas profession. If Mr. Clegg would send a written communication to the Council on the point he would see that the matter was thoroughly ventilated.

The proceedings then concluded.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION



A Glimpse of the Blast Furnaces at Stanton.

AUTUMN MEETING AT STANTON

The Autumn General Meeting of the Eastern Counties Association was held at Stanton on Friday, Oct. 17, at the kind invitation of the Stanton Ironworks Company, Ltd., when a large number of members inspected the spun pipe plant.

THE STANTON WORKS.

The Stanton Ironworks Company, Ltd., near Nottingham, are the largest manufacturers of cast-iron pipe in Europe. Possessing their own sources of raw materials, they are able to exercise direct supervision over every stage of production, from the extraction of the raw materials and the manufacture of the pig-iron to the despatch of the finished product.

The Company own four coal-mines—situated at Teversal, Bilsthorpe, Pleasley, and Silverhill—ten ironstone quarries, and two limestone quarries. They have eleven blast-furnaces—five at Stanton, four at Holwell, and two at Wellingborough.

At their various works the Company employ no fewer than 14,000 workpeople, many of whom are housed on property owned by the Company. This includes several thousand acres of land, part of which is farmed.

The Company's chief product is the Stanton Delavaud spun-iron pipe, over 16,000 miles of which have been sold during the last 13 years. The Delavaud system of centrifugal pipe-casting was pioneered at Stanton, where the first plant in the world for the commercial production of Delavaud pipe was put into operation in 1922. The system has since been adopted by other firms, and is now carried on in the leading manufacturing countries of the world.

The Company also manufacture vertically sand-cast iron pipes and "specials," concrete-lined spun and cast-iron pipes, and concrete pipes. Each week, approximately one hundred miles of pipe are produced at Stanton.

Other important Stanton products are cast-iron tunnel segments and Stanton "Hard-Stud" cast-iron road-sections.

The Spun Pipe Plant.

The Stanton spun pipe plant is one of the most up-to-date centrifugal plants in Europe. It comprises eight cupolas, twenty spinning machines, and five annealing furnaces.

The raw materials and fuel, including pig-iron, coke, and limestone, are stored in bunkers, from which they are transferred to the cupola in skips. The molten metal, which attains a temperature of 1,400° centigrade, is tapped into 3-ton casting ladles, which are conveyed to the spinning machines by an electric telpher crane.

The molten metal is tapped into 3-ton casting ladles, which are conveyed to the casting shop by means of a 5-ton electric crane running on a telpher runway.

The pipe is formed in an accurately machined cylindrical steel mould, the inner dimensions of which coincide with the outer dimensions of the finished pipe, including the enlarged formation of the socket end. The mould is revolved on its own axis by means of an impulse water turbine inside a water-cooled iron casing. This revolving mould is supported at two points in its length by two sets of friction rollers, which have bearings on the inside of the casing, and are lubricated by grease cups accessible from the outside.

The casing, with its revolving mould, is caused to traverse backwards and forwards on its bed-plate by means of a hydraulic cylinder beneath the casing. Through the annular space between the cylinder and the casing, the cooling water is circulated, being kept at a constant temperature and pressure. A tilting ladle and a cantilever trough supply the metal to the revolving mould. The only core used is that which is necessary to shape the inside of the socket. The bed-plate of the machine slopes slightly away from the tilting ladle so as to give the metal, during casting, the requisite fall, and ensure uniform thickness of metal in the pipe.

The spinning of the pipe is carried out as follows: The tilting ladle is filled with molten metal from the large ladle. This tilting ladle holds slightly more metal than is required for a single pipe of the size to be cast. The movable casing containing the mould is moved up towards the tilting ladle, the cantilever trough projecting into the interior of the mould towards the socket end.

The pelton wheel is started, and when the mould has acquired the proper speed the tilting ladle is tipped forward, the molten iron being discharged down the cantilever trough. When the socket portion of the mould is filled with metal the casing is traversed away from the tilting ladle at a definite speed, which assures the molten metal lining the mould evenly throughout its entire length. When the mould reaches its extreme position, it is clear of the end of the spout, and any excess of metal in the trough is discharged into a receptacle at the side of the machine. The rate of tilting of the ladle, the peripheral speed of the mould, and the traverse of the machine are all in a constant ratio for any particular size and thickness of pipe.

The molten metal solidifies in a few seconds, and when contraction has taken place the pipe is withdrawn. Owing to the rapid cooling of the pipe in the water-cooled mould, the outer skin of the pipe is slightly chilled, and it is necessary to heat-treat it in order to normalize the structure. To do this the pipe is passed straight from the cast-

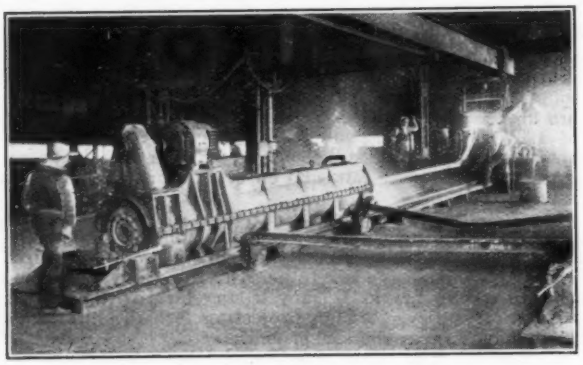
Hydraulic Testing of Stanton Delavaud Spun Iron Pipes.

ing machine over an automatic weighing machine to the annealing furnace.

Annealing Furnace.

These furnaces are heated by gas, and the temperature of the pipes is raised to about 1,700° F., which temperature is maintained while passing through the heat zone, which is about one-third of the entire length of the furnace. The pipes cool down in passing through the remainder of the furnace to such an extent that there is no possibility of chilling on emerging from the furnace. The temperature of the furnace is controlled by means of thermo-couple pyrometers connected with a thread recorder.

On withdrawal from the furnace, the pipes are mechanically cleaned and scrubbed inside by means of a revolving grinding machine. From here they pass on to the dipping tanks, where they are coated with Dr. Angus Smith's mixture. The coating mixture is kept at 300° F., the temperature being registered on a recording thermograph. Thence the pipes go forward to the hydraulic testing pumps, where each pipe is tested to double its working pressure.



The Centrifugal Casting Machine.

The speed of rotation of the mould is an important factor in the satisfactory production of centrifugal castings. The speed lies between a minimum, below which the metal fails to hold up against the mould face, and a maximum which is determined by the speed capabilities of the casting machine. The optimum speed is known for each size of pipes cast, and has been found by numerous tests carried out on pipes cast at varying speeds.

Having determined the correct centrifugal force necessary to give the best results on any particular sized pipe, it was found that the ideal speed could be calculated for any size of pipe, the radius of gyration being taken at the mean diameter. It follows from this that the thickness of the pipe must be taken into consideration in arriving at the speed of rotation for pipes of various diameters.

An interesting experiment was witnessed to determine the strength of pipes when subjected to bending stresses.

The Stanton Hume concrete plant was also visited. Here the manufacture of concrete pipes is also carried on by centrifugal force, and sizes ranging from 4 in. to 72 in. are turned out, together with concrete slabs, kerbs, and fence posts. These concrete pipes are all reinforced, and considerable care is taken in their production, many different grades of sand, &c., being used to obtain the finished whole.

ENTERTAINED AT LUNCH.

At the conclusion of the inspection of the pipe-making plant the members assembled in the works club room, and were entertained at luncheon by the Stanton Ironworks Company—Mr. E. J. Fox (Managing Director) presiding, being supported by other senior officers of the Stanton Company, together with the President of the Association, Mr. B. Clarke.

The PRESIDENT expressed to the Stanton Ironworks Company and to Mr. Fox the thanks of the members for the opportunity of visiting the works. The number present would be, he thought, sufficient indication of their appreciation. It was unusual for the Association to hold this Autumn Meeting in the provinces, and when the scattered nature of their area was realized it could be regarded as a compliment to their hosts that there was such a muster. Their visit had enabled them to acquaint themselves more intimately with this great concern whose name was so well known in the Gas Industry generally. They felt that the Stanton Ironworks Company had contributed in no small measure to their success in so far as they could not do without pipes. In addition to the privilege of inspecting the works they were also indebted to the Company for the hospitality which had been most generous.

Mr. F. PRENTICE (Ipswich) said that it gave him much pleasure to support the President's remarks regarding the facilities provided by the Stanton Company. It was, he said, many years since he had last visited these wonderful works and seen the manufacture of the pipes which were more or less in vogue in those days. He had laid twenty miles of these mains, and it was a most successful installation, which, so far as he could determine, would be good for fifty or a hundred years to come. They were particularly interested in the manufacture of pipes, for they could not send out gas without them, and it was essential that they should be as sound as possible. Successful engineering ability had been exploited by the Stanton Company, and they were under a great debt of gratitude to them for enabling the Association to see how this was accomplished. He would also like to support the President in thanking the Company for their hospitality.

Mr. E. J. FOX said how delighted they were to receive the members at Stanton that day. No man could pay a greater compliment to another than to give up a day to go to see him. He was the only man living, observed Mr. Fox, who had been in the centrifugal pipe-making business from the very beginning. They at Stanton could claim that they had exploited a process which had established itself and had become a recognized method of cast-iron pipe manufacture. Incidentally, there was no doubt that centrifugal pipes had been instrumental in saving the Gas Industry hundreds of thousands of pounds; and those who were interested in the extension of the Gas Industry could not do more than help to reduce the capital cost of distribution. The Stanton Company did consider that they were doing a little good in endeavouring to reduce their costs in order to enable gas undertakings to extend their mains.

The Stanton Process.

Mr. FOX went on to refer to some of the aspects of the manufacture of centrifugal spun pipes. In the first place, he said, the Stanton Ironworks Company adopted a process of manufacturing metal pipes in a metal mould. That pipe, in consequence of being produced in a metal mould, had a chill on it. Thus, when that chill was removed in the annealing furnace, they had a pipe of a strength in excess of anything previously attained in the metal pipe. More recently the Belgians evolved a method of making pipes in a similar mould but introducing a ferro-silicon powder into the mould before spinning—thus avoiding the chill and the consequent necessity of annealing. Messrs. Cochrans, of Middlesbrough, were manufacturing a metal pipe which avoided the chill in the same way.

At Stanton, however, they had discovered in their laboratory that if the Cochran pipe were subsequently normalized by passing it through a furnace, a strength of pipe was obtained far greater than anything dreamt of in cast-iron pipes. By adopting this process, for which they had taken out a licence from Messrs. Cochrans, and heat treating the pipe, they had thus a strength of pipe far in excess of anything previously possible—and this was the pipe they were making to-day.

Pipes, continued Mr. Fox, used to be sold by the ton, regardless of any type of joint. To-day the Company were selling by the yard. The Stanton-Wilson self-adjusting joint had undoubtedly given cast-iron pipes a joint which was, under all conditions, guaranteed tight. A more recent joint still was the Stanton mechanical lead joint, which would displace the ordinary run lead joint. Gas engineers during the last ten years had been largely responsible for modernizing their equipment. Yet, in the jointing of their pipes they seemed content with a relic of barbarism. The old-fashioned run lead joint depended largely upon the skill of the individual in obtaining a tight joint. The Stanton mechanical lead joint would therefore assist in cheapening the cost of distribution by reason of the fact that it could be made by unskilled labour—and thus help the Gas Industry to continue to expand.

BUSINESS MEETING.

The Autumn General Meeting of the Association was held at Stanton in the afternoon—the PRESIDENT (Mr. B. Clarke, of Stamford) in the chair.

On the proposition of Mr. J. H. TROUGHTON (Newmarket), seconded by Mr. H. R. WIMHURST (Bury St. Edmunds), the minutes of the previous general meeting, as published in the Technical Press, were taken as read, confirmed, and signed.

The PRESIDENT then took the opportunity of welcoming the visitors, of whom he mentioned Mr. D. M. Henshaw, Chairman of the Society of British Gas Industries. It was a compliment to the Association that he should be with them that day, and they assured him a hearty welcome along with their other visitors.

The HON. SECRETARY (Mr. W. C. Chapman, of Boston) read apologies for absence from Col. W. M. Carr (President of The Institution of Gas Engineers) and from officers of kindred associations.

He thereafter announced that resignations had been received from Mr. E. F. H. Lain (Kelvedon), an Associate Member since 1901; Mr. A. L. Griffith, an Associate Member since 1914, until recently Secretary of the S.B.G.I.;

Members of the Eastern Counties Association at Scanton.

and Mr. G. Helps (Nuneaton), a member since 1908. These resignations were accepted with regret.

New Members.

On the proposition of Mr. R. WARDELL (Peterborough), seconded by Mr. C. E. BYRT (Gainsborough), the following applicants were elected: To membership, Mr. W. Bolton (St. Neots); and to Associate Membership, Mr. A. Whatmore (Disley), Mr. L. F. King (Fletcher, Russell, & Co., Ltd., Huddersfield), and Mr. H. A. Hobson (W. Parkinson & Co., Birmingham). The President welcomed each of these new members to the Association.

Mr. F. G. BROCKWAY (Cleethorpes) proposed that their President (Mr. B. Clarke) be elected to represent the Association on the Council of The Institution of Gas Engineers, remarking that he was sure that Mr. Clarke would very worthily represent them with credit both to the Association and to the Parent Body.

This was seconded by Mr. C. R. FOWLER (Leiston) and unanimously agreed to—Mr. Clarke briefly acknowledging this further confidence in him as their President.

The New President.

The PRESIDENT said that he considered it a privilege to move that Mr. G. Wright, of Lincoln, be elected the next President of the Association. He knew that this resolution would be received in a spirit of unanimity and goodwill. They were assured of his abilities, for he had already made a great name for himself in the Gas Industry. He would have their best wishes in undertaking the duties of President.

Mr. J. KENNINGTON (Grimsby) seconded this resolution, which was carried unanimously.

Mr. G. WRIGHT, in acknowledging his election, remarked that he would do his utmost to further the interests of the Industry in general and of the Eastern Counties Association in particular. He appreciated very much the confidence which they had reposed in him, and he trusted that at the end of his year of office none of them would have any regret in the choice they had made that day.

Mr. T. GLOVER (Norwich) thereafter moved that Mr. C. R. Fowler, of Leiston, be elected Vice-President of the Association. It was very gratifying to the older members, as well as to the younger ones, that they had young and enterprising engineers ready to take an enthusiastic part in the conduct of this Association in the way it had been conducted for many years past for the benefit of the Industry. Mr. Fowler was one of these young and enterprising engineers who was willing to serve them, and they were all very glad to have him as Vice-President with a view to his becoming their President in due course.

Mr. J. E. YOUNG (Grantham), in seconding, felt that they were making a very wise choice in electing Mr. Fowler to Vice-Presidency of the Association. The men from the small works, he said, were very often great in mind. The resolution was carried.

Mr. C. R. FOWLER returned thanks for his election and said that he would carry out his duties to the best of his ability.

On the proposition of Mr. J. H. TROUGHTON, seconded by Mr. P. D. WALMSLEY (Great Yarmouth), the vacancy on the Committee was filled by the election of Mr. A. L. Higham (Norwich).

In moving the re-election of the Association's Auditors (Mr. G. A. Mallet, Ipswich, and Mr. W. S. Venner, Brentwood), Mr. H. R. WIMHURST remarked that these gentlemen had served the Association very faithfully for many years past. Their duties might not be very onerous by reason of the care exercised by their Hon. Secretary and Treasurer, but, nevertheless, they were very important. In these two gentlemen they had Auditors who had carried out their work very carefully and had watched the interests of the Association. He proposed their re-election with the heartiest thanks for their past services.

This proposition was seconded by Mr. J. GREEN (Wisbech) and unanimously agreed to.

Mr. G. WRIGHT then proposed the re-election of Mr. W. C. Chapman as Hon. Secretary and Treasurer. Only those in close association with Mr. Chapman could appreciate the amount of work that this office entailed. It would be base ingratitude on their part if they did not "inflict upon him" a further year's work.

The PRESIDENT seconded the resolution, remarking that only the President could really appreciate the amount of work the Secretary had to do. He was the man who steered the ship right through.

Mr. W. C. CHAPMAN, in acknowledging his re-election, thanked Mr. Wright and the President for the kind remarks they had made in regard to the manner in which he had performed his duties. The work, he said, was very interesting, though he would not deny that it was at times somewhat irksome—and he did feel that his term of office would, within a year or two, have to terminate. He therefore hoped that some of the younger members of the Association would consider whether in the near future they would undertake this office. He did thank them most sincerely for the manner in which they had endeavoured to lighten his duties and give him every assistance. He hoped that Mr. Wright would have a very successful year, and he was sure all the members would do their best to help him to attain that end.

The Education Scheme.

The HON. SECRETARY went on to refer to the position of Secretary of the Education Scheme and Salesmanship Course, held by Mr. E. F. Keable, of Gorleston, and stated that within the past month Mr. Keable had intimated his desire to be released from that Office. He, the Hon. Secretary, however, was glad to report that after further consideration Mr. Keable had stated that it would be possible to undertake the duties again, and he would like to express the hope that the members would avail themselves of his services in this connection, in view of Mr. Keable's past valuable work and his position as Examiner under The Institution of Gas Engineers.

Mr. F. PRENTICE then formally proposed the resolution for the re-election of Mr. Keable, and this, having been duly seconded by Mr. S. HANDS (Sleaford), was carried unanimously.

The PRESIDENT stated that there had been no calls upon the Benevolent Fund during the year, so that he virtually left it in a better condition than when he found it.

An Invitation to Lincoln.

The PRESIDENT-ELECT (Mr. G. Wright) extended to the Association a cordial invitation to hold their next meeting (in May, 1936) at Lincoln. It was not only an ancient city, he said, but it also had some very up-to-date industries; and a visit would be of interest to all of them. He

suggested that the Association should include the ladies to a greater extent in their proceedings and said that he would like to see their next meeting embodying a dinner and dance.

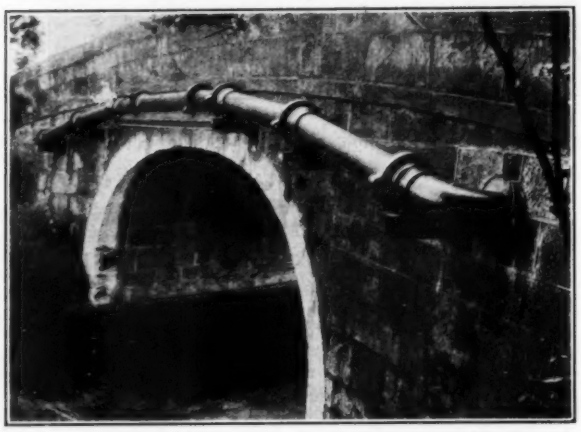
The HON. SECRETARY remarked that this was a very happy thought, and he saw no reason why their gatherings should not be more convivial by the welcome introduction of the ladies.

On behalf of the Association the PRESIDENT accepted with the greatest pleasure Mr. Wright's kind invitation to Lincoln.

Mr. P. D. WALMSLEY also endorsed the suggestion that the ladies be invited to their gatherings—a proposition which was agreed to unanimously.

This concluded the business of the meeting, and a general discussion on the Paper by Mr. P. H. Wilson, entitled "The Latest Form of Flexible Pipe Main for Gas," followed. This Paper, together with a report of the discussion will be found on other pages of this issue.

The members were afterwards entertained at tea by the Stanton Ironworks Company, which concluded a most enjoyable day.



An Exposed Section of Stanton-Wilson Main Laid by the Morecambe and Heysham Gas Department.

THE LATEST FORM OF Flexible Pipe Main for Gas

By P. H. WILSON, M.I.Mech.E.

This Paper was read to the Eastern Counties Gas Managers' Association by Mr. P. H. Wilson, Foundry General Manager to the Stanton Ironworks Company, on the occasion of the Association's visit to that works on Oct. 17.

The fact that cast-iron pipe has been the principal medium for the transmission of gas since the inception of the Gas Industry, and that many of the first cast-iron gas mains are still in use to-day after over a century of service, is a proof of the reliability and longevity of cast-iron mains which must be acknowledged by all engineers.

It cannot be denied, however, that in these days of heavy traffic the older types of cast-iron pipe-joint—in particular, the turned-and-bored and the open-socket lead joint—are not so generally satisfactory as they were twenty or thirty years ago. Owing to their unyielding rigidity, which provides for neither lateral movement nor longitudinal expansion, they are occasionally unable to withstand the heavy vibration set up by modern traffic.

When one considers that the foundations of centuries-old buildings have been seriously impaired by this vibration, it is hardly to be expected that rigid mains laid a few feet below the ground level should escape undamaged. This problem is, in fact, no reflection either on the pipes or the pipe joints; it is merely evidence that in the days when lead-joints were designed, the advent of heavy motor traffic was unforeseen, and that modern mains require joints designed expressly to meet modern conditions.

An older, but somewhat similar problem, is encountered in subsidence areas, such as colliery districts, where it is frequently necessary to provide mains with some means of accommodating themselves to the subsoil movements caused by undermining.

To the engineer who desires to provide against either or both of these contingencies, two alternatives are open. Either he can use pipes which are themselves of a more or less flexible material, or he can obtain the required flexibility entirely from the joints. The disadvantage of the former plan lies in the obvious fact that pipes themselves cannot be deflected without setting up unequal stresses in the metal. On the other hand, by using cast-iron pipes with flexible joints, it is possible to secure the great durability of cast-iron combined with sufficient flexibility to meet all normal contingencies.

The Stanton-Wilson Self-Adjusting Pipe-Joint.

In order to give this highly desirable property of flexibility to Stanton Delavaud spun-iron mains, we have designed a type of pipe-joint known as the Stanton-Wilson self-adjusting joint. The principal advantages of this joint are that it gives mains a flexibility which enables them to resist the effects of ground subsidence and traffic vibration; it can be assembled by unskilled labour under the most adverse conditions, and in considerably less time than is required to make a lead joint; and it remains leak-tight under high or low pressures. It is equally suitable for gas or water mains, and has, in fact, already been used by over 500 public undertakings, both gas and water. During the last five years, over 800 miles of our spun-iron pipes have been laid with Stanton-Wilson joints.

The joint consists of two loose parts only—a cast-iron locking-ring, and a joint-ring of special rubber, V-shaped in section and provided with a lead sheath. The locking-ring is placed on the spigot; the joint-ring is then placed in front of it, and the end of the spigot is entered into the socket. On the socket are cast three external lugs, with helical faces, which engage with three similar lugs on the locking-ring. When this locking-ring is rotated in a clockwise direction by means of a simple rack-and-pinion tackle, an inner projection on the collar is thrust forwards, compressing the joint-ring into position.

The Joint Ring.

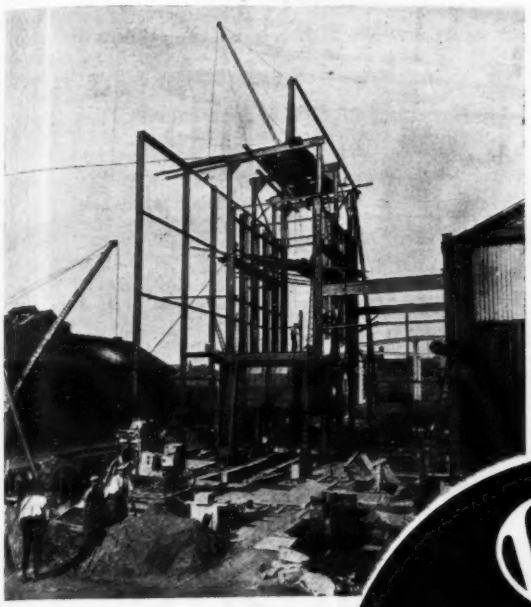
As previously mentioned, the joint-ring employed in the Stanton-Wilson joint is made of special rubber, and is protected from the gas in the main by a lead sheath.

The great resiliency of rubber and its power of retaining that resiliency over long periods, make it particularly suitable for the jointing of pipes. It has been scientifically established that the two essential conditions necessary to enable rubber to retain its strength and elasticity are that it should be kept in constant compression, and protected from light and air. The design of the Stanton-Wilson self-adjusting joint ensures that both these conditions are complied with.

There is nothing new in the use of rubber as a jointing-material for gas mains. A short time ago, through the courtesy of Mr. F. P. Tarratt, M.Inst.C.E. (Chief Engineer of the Newcastle and Gateshead Gas Company), the Research Association of British Rubber Manufacturers were enabled to carry out experiments on several rubber joint rings which had been in service in the Gateshead district for about sixty years. Comparative tests were carried out on these rings, and on other rings which had been in service for about two years. The old rings had been compressed into an annulus 6 mm. wide between socket and spigot. The fact that after release their thickness increased to 8 mm. was evidence of a considerable power of elastic return. Absorption tests and resiliency tests were also carried out on both types of ring, with results which demonstrated that both types of ring were fully capable of maintaining gastight connections.

It should be borne in mind, however, that the rubber used for modern joint-rings is considerably superior to that commercially available sixty years ago. We have

IN COURSE OF CONSTRUCTION



Construction in progress on an installation of W-D Continuous Verticals for Loughborough Gas Dept.

W-D Carbonising Plants at present in course of construction will, when put into operation, be capable of carbonising a total of over —

2,700,000
TONS OF COAL PER ANNUM

W-D

Carbonising Plants

W-D Continuous and Intermittent Verticals
W-D Becker Ovens

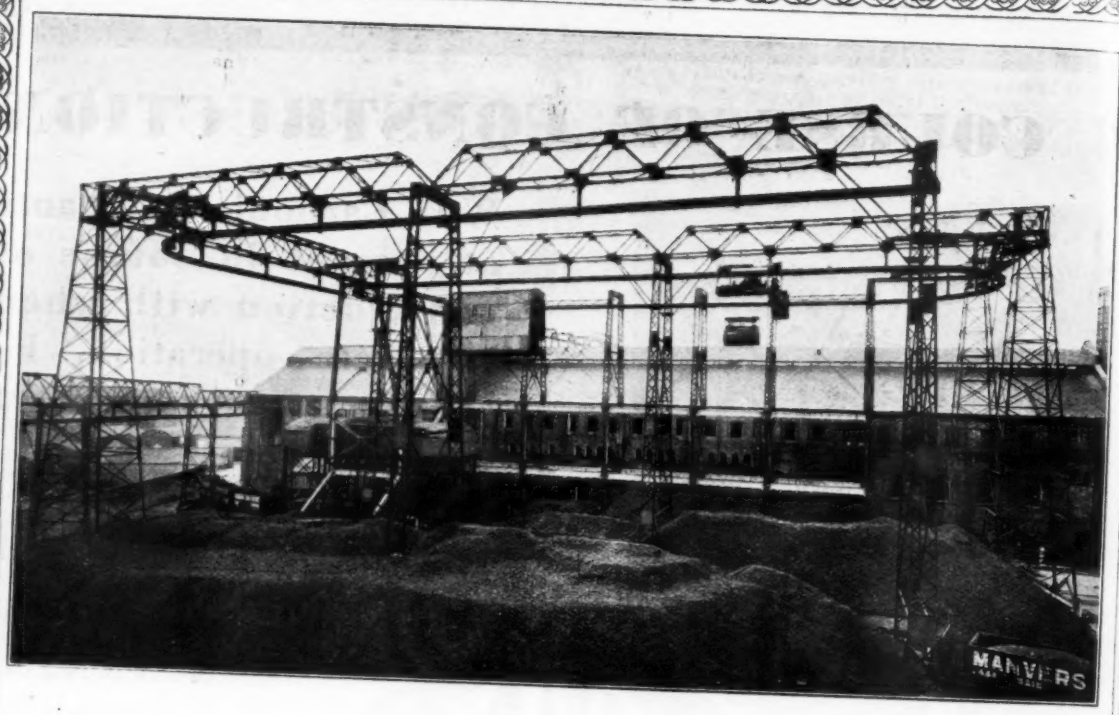
An installation of W-D Continuous Verticals put into service recently for the Exmouth Gas Co.

IN SERVICE
"THE WORLD OVER"

W-D Carbonising Plants have been built in 24 countries and in works of all sizes. Their total carbonising capacity is now very nearly ——

14,900,000
TONS PER ANNUM

THE WOODALL-DUCKHAM VERTICAL RETORT AND OVEN CONSTRUCTION CO. (1920) LTD., EBURY & ALLINGTON HOUSES, 136-150 VICTORIA STREET, LONDON, S.W.1
Members of the Society of British Gas Industries
Telegrams: "Retortical, Sowest, London" Telephone: Victoria 8631 (6 lines)



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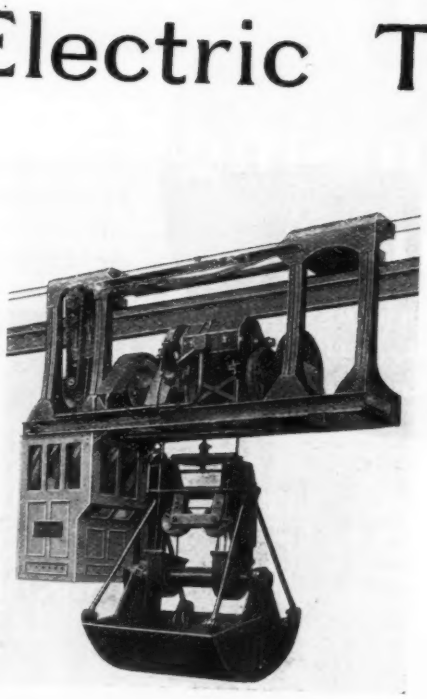


FOR
COAL
AND
COKE

ROBERT DEMPSTER & SONS LTD.
ELLAND.

1855 LONDON OFFICE : 16, Queen Anne's Gate, Westminster, S.W.1 **1935**
Wire : "ELLANDORS, PARL, LONDON." Phone : Whitehall 2661.

carried out exhaustive tests on Stanton-Wilson joint-rings in order to determine their suitability for gas mains. For example, they have been subjected over a period of six months to the effects of ordinary town gas, which was mixed at various periods with hydrogen sulphide and sulphur dioxide. This treatment had no adverse effect on the rubber, while the lead showed no evidence of brittleness or other physical change.

An Exacting Test.

A practical demonstration of the efficiency of the Stanton-Wilson joint was given at the British Industries Fair, Birmingham.

A joint was used to couple two spun-iron pipes which were continuously vibrated ¼ in. from alignment in order to demonstrate the effects of traffic vibration. During the Fair the joint made no fewer than 3,696,000 movements, and the initial air pressure was maintained without the joint having once to be tightened, re-made, or pumped up.

Laying in Water-Logged Trenches.

It will be appreciated that one of the principal advantages of the Stanton-Wilson joint is the comparative ease with which it can be made in water-logged trenches. This feature was found particularly useful during the laying of spun iron coke-oven gas mains 24 miles long for the Derby Gas Light and Coke Company. Purified coke oven gas is transmitted at high pressure from the ovens of the Clay Cross Company and the Blackwell Colliery Company to a gasholder at Belper, from which it is transmitted to Derby. The mains used for this purpose consist of Stanton-Delavaud spun-iron pipes, 12 in. and 15 in. in diameter; and in view of the peculiar difficulties of laying and the necessity for maintaining absolutely leaktight joints in a district very liable to ground subsidence, Sir John Ferguson Bell—then Engineer to the Company, and now Chairman—decided to couple these mains throughout with Stanton-Wilson self-adjusting joints.

The 12-in. diameter main runs from Clay Cross and Blackwell to meet at the village of Shirland. From this point the gas passes through a 15-in. diameter main into Belper via Oakerthorpe, Buckland Hollow, and Heage.

The 12-in. main from Blackwell to Shirland is 5,326 yards in length, and traverses an area in which joint flexibility is very desirable owing to the fact that the district has been undermined and ground subsidence frequently occurs. In this particular section, however, the value of the Stanton-Wilson joint was first demonstrated in the actual laying of the main. Owing to the proximity of a brook, the low-lying ground is water-logged even during the summer months, and laying was further handicapped by heavy rains which began shortly after the work started. However, owing to the simplicity of the Stanton-Wilson joint, it was found possible to continue jointing even after the brook had overflowed its banks and submerged part of the site. Obviously, lead-caulking would be difficult or even impossible under these conditions.

Similar difficulties were met with in the laying of the 15-in. main between Belper and Shirland, which was 15,093 yards long and traversed low-lying, water-logged ground undermined in places by colliery workings. Despite these conditions, the work was carried out with comparative ease, a total of 2,443 pipes being laid in three weeks. After jointing was completed, the mains successfully withstood a test pressure of 100 lb. per sq.in.

Crude Gas Conveyance.

All engineers who have had to deal with the conveyance of crude gas will realize the very great importance of ensuring that the mains are absolutely leaktight. This applies particularly to mains laid in agricultural districts, as even a slight leakage of crude gas has an extremely adverse effect on neighbouring vegetation. Bearing this in mind, the successful use of the Stanton-Wilson joint in a main laid by Mr. Ralph Halkett (Engineer to the Sheffield Gas Company) for the conveyance of crude coke oven gas is a particularly interesting indication of the leaktightness of this joint under considerable pressures. The main in question formed a section of the Company's grid system, and was used as a feed main to convey crude coke oven gas from the ovens of Beighton Colliery, owned by the Sheffield Coal Company, to the trunk main at Hanworth. It is about 5,000 yards in length, and traverses a district undermined by colliery workings, so that the flexibility of the joint is here fully utilized.

Subaqueous Mains.

The difficulties of laying mains across rivers or canals, using the usual types of lead joint, are too well known to need description. The experience of a large number of engineers goes to prove, however, that these difficulties may in all cases be minimized and in many instances obviated altogether, by the use of the Stanton-Wilson self-adjusting joint. The fact that no molten lead or special tools are required, and that there are no small loose parts such as are easily lost when jointing below water, is a great advantage in mains of this type.

It is frequently practicable to make the joints with the pipes supported above water-level by ropes or packing. The completed main can then be submerged, the flexibility of the joints enabling it to adjust itself to the contours of the bed of the stream or canal. If necessary, the joints can be assembled with the pipes in position, and with the socket wholly or partly submerged.

A rather more complicated type of installation is that in which it is desired to lay a main across a navigable river or canal, the bed of which is liable to be disturbed by dragging anchors. An interesting example of this type of pipe-line was installed recently by the Corporation of Grangemouth (Stirlingshire) Gas Department under the direction of the Engineer, Mr. A. Cuthbert. It was necessary to carry a 12-in. main across the Forth-Clyde Canal, at a point where it is some 60 ft. wide and 12 ft. deep. The canal could not be drained, and it was essential to complete the operations as soon as possible in order to avoid hindrance to traffic.

The pipe-line was laid in duplicate, the twin mains being installed side-by-side in the same trench. This trench was cut by dredging, and trimmed by divers to a reasonable profile. In the centre of each main, and at its lowest point, a Horsley syphon was to be located; and concrete slabs were placed in position to support these.

It is only necessary to describe the laying of the first of the two mains, as the second pipe-line was laid in a similar manner.

The main took the form of a flat U, and was assembled horizontally on punts, the pipes being attached to a timber structure in a manner which permitted their easy release when the main had been lowered into place. This timber structure was made strong enough to withstand the considerable lifting stresses which occurred when the assembly was hoisted by cranes into a vertical position. Water was excluded by means of plugs fitted to each end of the main. The timber was sufficiently buoyant to keep the submerged pipe-line just afloat when it was almost in position. This feature greatly simplified the setting of the joints in their correct positions. Before releasing the timber frame, the divers packed up each joint to its correct level.

Most engineers will agree that ordinary types of joints would have been unable to withstand the distortion which inevitably occurred during the installation of this main. However, no trouble was experienced with the Stanton-Wilson joints; in fact, the experience gained during the laying of the first main was used to such good effect that the second main was lowered into place in about three hours.

Technical Service.

These few installations are typical of the many instances in which Stanton-Wilson joints have enabled gas engineers to overcome laying difficulties. Our Technical Staff are always pleased to advise on the method of procedure to be adopted in any particular instance, and to place their wide and practical experience of pipe-laying at the disposal of any engineer.

Discussion.

The PRESIDENT (Mr. B. Clarke, of Stamford), in opening the discussion, remarked that they had been greatly impressed with all they had seen, and they realized the long life that these pipes had. This Paper recognized that there were certain imperfections in regard to the cast-iron pipe and especially in regard to the jointing, and this discussion would enable them to have their difficulties explained.

Mr. F. PRENTICE (Ipswich) remarked that the Paper was one which he had read with a great deal of interest. There had been one or two points which had raised some doubts in his mind, but after witnessing the practical demonstration of pipe-making that morning, those questions had been answered. They knew the cost of the various sizes of pipe in the ordinary way, but here they had a joint, ingenious and exceedingly effective, and they would like to know the difference in cost in laying, say, a mile of main with the new and the old joints. He would imagine that the self-adjusting joint, being so much quicker, would minimize the little extra cost.

Mr. H. SHEWRING (Cambridge) asked for some information in regard to the rubber which was used in the joint and its estimated length of life.

Mr. C. E. BYRT (Gainsborough) stated that he had used this joint and had found it very successful. On one occasion, in laying a straight length of 4-in. pipe, one man succeeded in laying 30 pipes in one day. The work involved with these joints was very simple. There was not much difference between making the lead joint and the Stanton-Wilson joint, but the advantage would probably go to the latter. His own difficulty had been

in the repair of mains and in the coupling up of old cast-iron pipes with the new Stanton-Wilson joint. They could not connect up the old with the new.

Final Cost Less.

Mr. W. BODEN (of the Stanton Ironworks Company) stated, in reply to the questions raised, that the prime cost of the Stanton-Wilson joint was certainly higher than the prime cost of the run lead joint. But there were so many factors involved in the actual laying that it was frequently found that the final main was laid more cheaply with the more expensive joint. There was a saving in final cost by reason of fewer holes having to be drilled and by dispensing with a number of specials on slow bends.

Then again, weather conditions and water-logged trenches had an important bearing on the matter when one had molten lead to deal with. He had seen a main half a mile long laid in water in Ireland with the Stanton-Wilson joint. That would have been very difficult with lead jointing. Again, one frequently came upon unexpected obstructions when laying mains, and it was very useful to be able—as was possible with the Stanton-Wilson joint—to pull the pipe over 5° to avoid them. As regards the life of rubber, the best evidence they had was the fact that with the rubber taken from the joints of some pipes which had been laid in Gateshead sixty years ago they were able to rub out pencil writing. It had been proved beyond doubt that if kept under compression, free from draughts, and away from sunlight, rubber lasted almost indefinitely. But in daylight it deteriorated very materially. They had very tight specifications for the rubber used in these joints, and they watched very closely its resistance to hydrogen sulphide, solutions of benzole, and other coal tar derivatives. Indeed, one of the largest oil groups had one of their joints for test, and they immediately enquired as to where they obtained their rubber, as they wished to use it for some of their own petrol lines.

The old cast-iron pipes were not true to diameter in respect of outside circumference, whereas the spun iron pipes were truly circular. So they experienced no trouble in connecting up to old spun pipes, but only to old cast-iron pipes. On one occasion a trunk main of 12 in. diameter and in 18-ft. lengths was being laid at Bath, and he saw ten men put in 33 pipes in three hours—that was 300 yards of main, laid, jointed, and prepared for test in three hours. On another occasion 25 lengths of 6-in. pipe were laid in one hour.

Mr. W. H. BLUNDSTONE (Newark) remarked that his predecessor at Newark was one of the pioneers of the Stanton-Wilson self-adjusting joint. One could lay pipes with unskilled labour and rest assured that the result would be a sound main. With the lead wool joint one was so much in the hands of the men, and when they were chasing that elusive unaccounted-for gas figure it was very useful to have a joint like this at their disposal.

Mr. D. B. PARKINSON referred to the new mechanical joint, and asked in what circumstances the Stanton-Wilson joint would be recommended and in what circumstances the mechanical joint, with the relative costs of each.

Mr. SHEWRING enquired whether the actual joint was effected by the lead or by the rubber or both.

Testing Unnecessary.

Mr. BODEN, in reply, remarked that he knew many engineers who had been in the habit of testing their newly-laid mains, had adopted the Stanton-Wilson joint and now considered subsequent testing a needless expense. It was true that the Company made both the Stanton-Wilson joint and the mechanical joint. As a definition for their use he would say that the mechanical joint was a substitute for the run lead joint, and as such it could be used with advantage. It was less susceptible to damage by vibration and could be made mechanically as distinct from the joint requiring skilled labour. He had seen half a mile of 3-in. pipe laid in Cumberland recently by two men who could not write their own names, and it was afterwards tested to 300 lb. water pressure without a sign of leak. In that case the trench was so wet that the use of lead for jointing would have been dangerous. This type of joint could be used for higher pressures with safety, whereas it was seldom that a run lead joint would stand up to high pressures. The Stanton-Wilson self-adjusting joint, on the other hand, was for use where there was heavy traffic vibrations, ground settlement, and so on. The use of this joint imparted to the cast-iron main all the suppleness of a steel main.

In reply to Mr. Shewring, Mr. Boden stated that they were satisfied that the lead actually formed the joint. In the design of the ring and the clearances it was so arranged that the lead tip just fitted the cavity between the parallel socket and the spigot, thus insulating the rubber from the conveyed liquid or gas. There was no percolation past the lead to the rubber.

Mr. A. WATSON (Manager of the Iron Pipe Department) said that he was responsible for selling the pipes to them. They had raised the important question of the cost of the Stanton-Wilson joint in comparison with the run lead joint. They would have gathered from the remarks of Mr. Fox at lunch that the policy of the Stanton Ironworks Company was to supply the Gas Industry with a mechanically made joint, and they did not want to thrust something expensive upon them. Their efforts were directed to making this joint as economical as possible both from the viewpoints of maker and purchaser. The cost of the Stanton-Wilson joint alone was higher than that of the run lead joint, but there were compensating factors which brought the final costs almost to a level. In fact, the Stanton-Wilson joint came out slightly cheaper. They had endeavoured to reduce the price in spite of the fact that the people who made the rubber rings were actually trying to raise the price. But the cost of lead was also going up. He did not think he was giving away any secrets when he said that they hoped in the near future to put the Stanton-Wilson joint on a basis which would render it very materially cheaper than the run lead joint.

The Reason for the Mechanical Joint.

The mechanical lead joint was cheaper, but the cost of making it was not very much less. Nevertheless, they found that it competed with the very low price of the run lead joint. The Stanton-Wilson joint had one particular purpose and the mechanical lead joint had another. When they put the mechanical lead joint on the market many people wondered why they had done so when they already had the Stanton-Wilson joint. Some people, however, did not want the Stanton-Wilson joint, but merely required a simple lead joint in view of the growing tendency to lay pipes under footpaths, where they were not subject to the same traffic vibrations. It was their policy to try to make those joints as cheap as possible.

Mr. D. M. HENSHAW, called upon by the President to say a few words in his capacity of Chairman of the Society of British Gas Industries, remarked that it was a matter for congratulation that the Stanton Company had adopted such advanced methods in pipe production. They realized that mechanical devices must be utilized, and it was gratifying that the Stanton Company had pioneered a movement of this nature, and he would like to thank the Company for giving a lead in this direction. That Mr. E. J. Fox was behind this concern was bound to be a comforting thought. He was glad to feel that the Association welcomed the S.B.G.I. at their meetings, and this tendency had been finalized in the formation by the various bodies of the British Gas Federation. His own successor, Mr. F. B. Richards, would appreciate the opportunity of coming among them.

Structure of the Metal.

The PRESIDENT said that they had neglected to refer in the discussion to the important question of the structure of the metal.

Mr. S. E. DAWSON (Chief Metallurgist to the Stanton Company) said that a good deal of work had been involved, and many problems had had to be faced, in order to provide a stronger pipe in competition with other pipes. They had to consider the brittleness of the material. It was a material which, by reason of its lack of homogeneity, was difficult to put on a better foundation in order to find what portion of its structure was responsible for this brittleness. All these problems had to be faced in order to increase the strength of the pipe itself as distinct from its formation and its joints. This entailed a great deal of research work. They had to provide a metal in the pipe still retaining the original tensile strength of the earlier form of pipe, while it must also have perfect resiliency to assist it in meeting those conditions which had been mentioned already.

The Stanton pipe consisted of two sections—not two separate sections, but one merged into the other. The outer zone was composed of an interlacing structure as would be embodied in any other cylindrical form in order to give the greatest resistance to bursting. The inner zone was intended to give the maximum resiliency and toughness to withstand long service. These were separate properties, and the combination of the two gave a pipe which had a resistance to impact of two, three, and four times that of any other pipe. The process employed by Messrs. Cochrans removed the chill by insulating the surface of the chilled mould with ferro-silicon powder. By insulating the mould they had succeeded merely in removing the chill. Stanton had retained the partial chilling effect of the steel mould in order to obtain a structure of metal such as they desired. This was a needle-like structure which surrounded the whole of the pipe and gradually emerged on the inside, while it was the normalizing treatment afterwards which gave the great degree of resiliency and toughness.

Mr. Dawson, in conclusion, showed the members a number of photographs illustrating the micro-structure of various pipes.

Vote of Thanks.

The PRESIDENT expressed the thanks of the Association for the instructive day they had spent.

This was seconded by Mr. T. GLOVER (Norwich), who remarked that the Stanton Company's activities marked a tremendous advance over the old practice by the attainment of less weight, greater strength and resiliency, and particularly a new form of joint so useful to engineers in mining districts.

Mr. WATSON, in acknowledging the vote of thanks, said that it was a pleasure to have the Association at Stanton that day. It had always been the policy of the Company to encourage visits to their works.

MIDLAND JUNIOR GAS ASSOCIATION

[*Photo by Elliott & Fry.*

THE PRESIDENT.

Mr. F. L. Atkin joined the Industrial Research Laboratories of the Birmingham Gas Department in 1917, and spent the first seven years in the Physical and Electrical Laboratories, being then transferred to the Industrial Heating Section. He has gained the Diploma of The Institution of Gas Engineers in Gas Engineering (Supply), and was awarded the Milbourne Medal in 1930-31 and the S.B.G.I. Medal in 1933. He is an Associate Member of the Institution of Mechanical Engineers, and a Member of Council of the Birmingham Association of Mechanical Engineers. He is Lecturer in Higher Grade Gas Supply at the Birmingham Municipal Technical College.

Presidential Address

OF

F. L. ATKIN, A.M.I.Mech.E.

(of the Industrial Research Laboratories of the Birmingham Gas Department)

Read at the Opening Meeting of the Association in Birmingham on Oct. 3.

The Pre-War Period.

A few years prior to the commencement of the War, the industrial gas consumption in Birmingham was comparatively small. It was probably a smaller percentage in other parts of the country, because in Birmingham the jewellery trade was very flourishing and a considerable amount of gas, relatively, was used for the manufacture of these articles. Blowpipes, side lights, small crucible melting furnaces, and muffles were the principal uses in this trade. To this load were added a few tool hardening muffles and a number of glue pot heaters and soldering iron stoves (consisting mainly of glorified ring burners) and also the gas engine load. About 1911 high-pressure gas (approximately 12-14 lb. per sq.in.) was introduced to the non-ferrous casting industry, which industry has been particularly associated with Birmingham.

The science of the metallurgy of carbon steels was progressing and the treatment of these metals demanded a more accurate means of control than was available in the coal-fired furnaces which were the only practical alternatives. Brass stampings and spinnings were taking the place of castings, and manufacturers began to appreciate the advantages of gas-fired furnaces for the annealing of these articles between the various drawing operations. Insulation, recuperation, and automatic temperature control were practically unknown during this period, just before the War.

The War Period.

During the War the use of gas was rapidly extended, due to munition requirements, which were the annealing of sheet brass between the various drawing and other operations connected with the production of cartridge and shell cases, the hardening of punches, dies, and tools used in the manufacture of the latter, shells, the case hardening and heat-treatment of machine tool parts, components used in armoured cars, tanks, aircraft, and similar equipment.

This period was very useful from the point of view of industrial sales, inasmuch as it introduced to the engineering and allied trades the many advantages to be obtained from the use of gas—advantages which are now common knowledge. The three chief features directly affecting the manufacture of munitions were high production, temperature control, and flexibility; hence the popularity of gas.

The greater use of the pyrometer played no small part in the increased use of gas for heat-treating.

During the War furnaces had to be produced as quickly as possible; all that was required was a temperature of 700°-900° C. in the shortest time and as evenly as possible. The furnace manufacturers responded very well and fulfilled the requirements, but naturally fuel economy was of secondary importance. Insulation as we now know it was very rarely used and then only to obtain high temperatures, although as far as the latter is concerned most furnace manufacturers preferred to take the least line of resistance and fit air-blast burners. Such a furnace was comparatively cheap to buy and many such furnaces are doing yeoman service at the present time. It is really remarkable when one looks back that furnaces nearly 20 years old are still performing useful work; in many cases if such a furnace failed, the whole output of the factory would come to a standstill, and yet the manufacturer can point to very little of his plant which has given him such service. As a matter of fact, the furnace is likely to go on functioning in the same way for another 20 years, but it is these very same furnaces which have given us so many heart-aches.

The furnaces were crudely constructed, usually steel plates and angles and 4½-in. firebrick. As I said before, the furnace manufacturers are not to blame, for they fulfilled a great need and very well indeed, but when a consumer who has had experience of these furnaces is asked for two or three times the original cost for a new one—well, to say the least of it, he objects. There is a more serious difficulty, however; it is that our electrical competitors have made capital out of these veteran furnaces. They have introduced equipment with insulation and automatic temperature control, not from choice but out of sheer necessity to produce a workable furnace, and then compared these with those old simple types of furnace. The tide has turned, however, because prospective users have realized the value of insulation and automatic temperature control, and are prepared to pay for these refinements, and this attitude, coupled with the low thermal cost of gaseous fuel compared with electrical energy, has turned the scales once more in our favour.

The Post-War Period.

During the last 17 years the use of industrial gas has progressed rapidly.

So far as competition with other fuels is concerned there have been distinct phases of varying magnitudes; nevertheless there has been an increased use of gas, subject, of course, to the usual cyclic trade depressions. This has been in three directions:

(1) By replacing other fuels in established industries.
(2) By extension of the use of gas in established industries.
(3) By the use of gas in new industries and processes.

The quantity of gas used under these three items is subject to increases in commodity output, and during the last

few years there is no doubt that we have shared in the general trade prosperity.

1. The Replacement of Other Fuels by Gas.

The alternative fuels available are coal, coke, producer gas, and oil. Except for very large furnaces, coal and coke are practically obsolete. This is mainly due to the efforts of the industrial gas engineers some 10 or 12 years ago. The records of tests and experiments carried out during this period by the Industrial Heating Section of the Birmingham Gas Department show that a considerable amount of work was done in this direction. Furnaces had to be redesigned and improved to compete with the solid fuel furnaces, which, from a "fuel only" point of view, were very cheap to run. Our present knowledge of furnace design and performance owes much to this spade work; indeed, many of the figures obtained still stand good to-day.

More important, however, is the fact that the consumer was educated to think "gas," and the sum total is that nowadays no-one would consider installing small coal or coke fired furnaces.

The larger solid fuel fired furnaces are associated with the heavy industries and are usually operating on a 24-hours a day basis, consequently the fuel costs are a greater percentage of the total costs. It is pleasing to record, however, that recently many have been converted to gas firing, chiefly due to the fact that the supply undertaking has been able to offer gas at an economical price.

Producer Gas.

Producer gas is still used, but only where the plant has been installed for some considerable time. Maintenance costs, capital charges on plant, coupled with the extreme difficulty of maintaining a constant quality and even pressure, have made its use an uneconomic proposition when compared with the thermal cost of town gas in large quantities (which is generally the case where producer gas is considered), and finally the improved efficiency of town gas furnaces has served to weigh the scales against producer gas.

Oil.

Competition with oil has been very interesting. Fifteen years ago oil, as a popular furnace fuel, was unknown, but when this fuel came on the market it gained rapid popularity. A consideration of its properties shows that it possesses many qualities usually associated with town gas—*i.e.*, it is portable, can be stored easily, no ashes, quickly available, &c., but above all its price is favourable; from 2½d. to 3½d. per therm. It should be remembered that although oil can be used in small quantities, or intermittently, it can be purchased at bulk rates, and therefore can be compared with gas at 6d. to 8d. per therm. Time has shown, however, that oil is not the universal fuel it was at first thought to be. A shortened life of refractories, difficulties in using very small quantities, smoke on lighting up, discomfort to the operator, lack of furnace atmosphere control, difficulties of automatic temperature control, and the inability to use full recuperation are the primary disadvantages of oil fuel. On the other side of the balance-sheet one has improved gas furnace efficiency, lower gas price, and the recent fuel oil tax.

At this stage I would like to pay tribute to the attitude of leading furnace manufacturers. I have confidence in stating that generally they have preferred to sell gas furnaces to oil furnaces.

Combining all these facts the position is generally that oil fuel firing is on the decline. There are, however, two aspects which have to be met. First, where comparative thermal efficiencies are almost equal—*e.g.*, boiler firing, &c.—and secondly where the overall thermal efficiencies are low such as metal melting and steel forging, the fuel cost assumes a large proportion of the total cost; in these two cases, the thermal cost of the oil is still lower than the ruling gas prices.

2. The Extension of the Use of Gas in Established Industries.

All the various phases of fuel usage outlined above have meant a continual fight on the industrial gas engineers' part. As fast as one particular item has been laid by the heels other problems have cropped up. Improvements in design and efficiency have been effected which have meant many months of study and experimentation. One cannot expect the consumer or even the furnace manufacturer to carry out this work. The former is only interested in his final product, while the latter sells his furnace anyhow.

During the period under consideration a considerable amount of experience has been obtained which has enabled performance data to be supplied to the consumer, and has usually led to an extension in the use of gas.

3. Gas Used in New Industries and Processes.

Developments in industry have been very rapid during the last decade. These may be divided into two main groups:

(1) Engineering—*e.g.*, Automobile, Bicycle, Electrical, &c.
(2) Non-engineering—*e.g.*, Food, Rubber, Glass, Plastic, &c.

In both groups progress has been made along three avenues:

(*a*) Increased production per unit, man, or machine power.
(*b*) Processing of new materials.
(*c*) More processes on existing materials.

Many of these processes have required a supply of heat in one form or another and it is not an exaggeration to say that we have secured the major portion of such trade. This is due mainly to our knowledge of the correct application of the gas *plus* the intrinsic virtues of town gas firing. Many of these processes demand thermostatic control, for which gas is eminently suitable, and is most easy in application.

Until two or three years ago gas undertakings and furnace apparatus manufacturers acted more or less independently. The larger undertakings were organized to deal with industrial gas problems, their methods and personnel differing somewhat. The smaller undertakings could not be expected to have the staff to deal with such problems; consequently they frequently sought the advice of the larger undertakings who were only too pleased to help them with that spirit of co-ordination and co-operation which has characterized the Gas Industry in the past. An unofficial exchange of information took place between the larger undertakings mainly by chance visits and word of mouth. The old Industrial Gas Salesmen's Circles were instrumental in fostering this exchange of ideas, but they seem to have faded away recently. I personally would welcome their revival. It was mainly owing to the fact that the smaller undertakings felt that they would like to profit by the experience of the larger concerns that the Industrial Centres Scheme was formed. It is essentially an attempt to solve industrial gas problems by nationalized co-ordination.

The functions of a Centre have been given recently ("JOURNAL," Vol. 208, pp. 761-2 and 822-4) by Mr. W. Dieterichs, Chairman of the Technical Sub-Committee of the Joint Co-ordinating Committee, which Committee is responsible for the organization of the Centres Scheme.

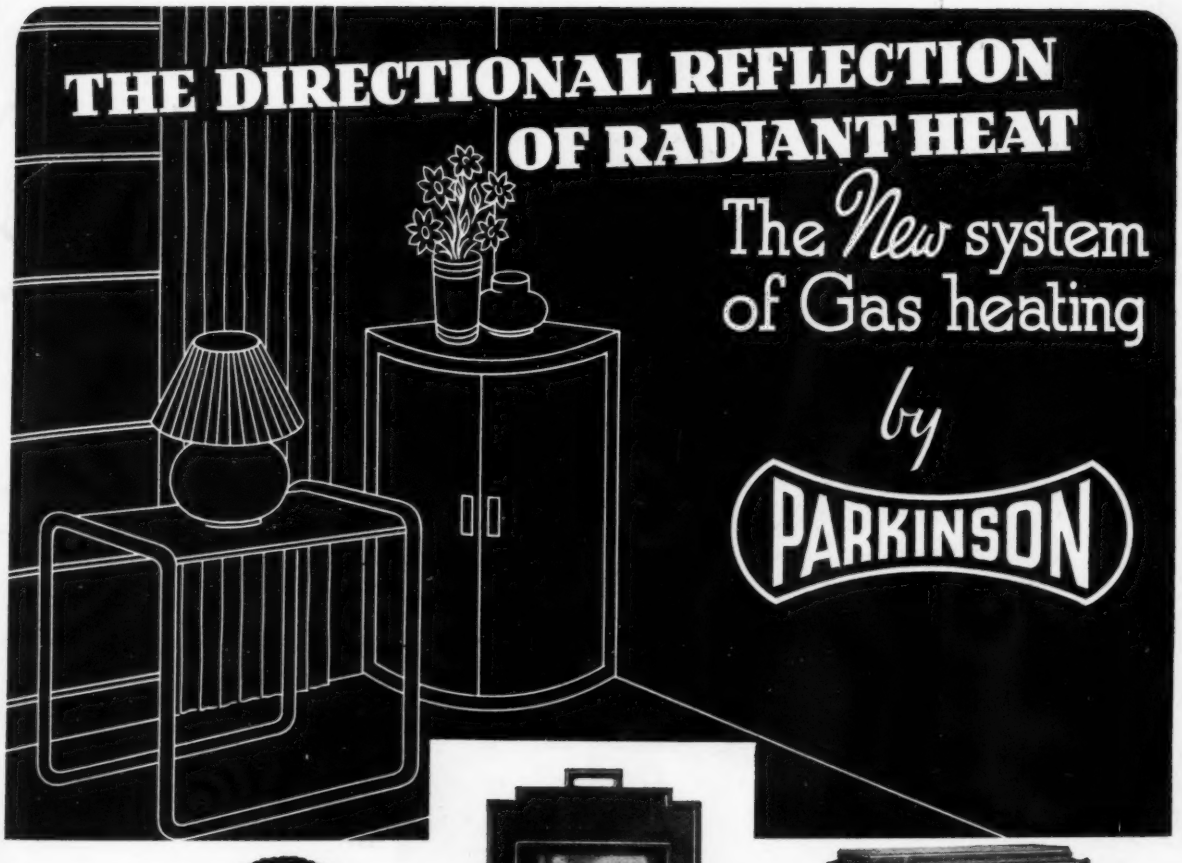
In addition to the various Centres, an Information Bureau has been set up in London to collect and collate information supplied by the Centres and gleaned from other sources. It is also their business to supply such information to the Centres when required. You will realize that this scheme represents a considerable effort on the part of the persons concerned and much progress has been made. However carefully formed, any new scheme has one or two snags; some can possibly be foreseen, and others are found out from experience, but as far as my knowledge goes there have been very few so far. One should, of course, be very wary of filed tests and records. From experience I know that these records are extremely valuable. We have in the Industrial Heating Section at Birmingham test records going back to over twenty years ago, but—and here is the snag—unless a qualified technical man is available who has been engaged on the type of work which is dealt with by the test report, it is subject to serious misinterpretation. Further, processes are changing so very quickly and industrial equipment is being improved so much that the figures that would stand two years ago would be quite out of date now. On the other hand, I could point to a number of processes which have not improved over the last ten or fifteen years. Another obstacle to the reliability of these reports is that the same processes and operations are carried out in varying ways in different parts of the country. There is no doubt, however, that provided one realizes the limitations, this collected information is invaluable.

It will be realized that the chief feature of the Scheme is that no matter how small the undertaking it can have exactly the same industrial service that the largest undertaking enjoys.

The Future Outlook for Industrial Gas.

And now, what of the future? Is the future of town gas likely to follow on the lines of its past evolution? It should be remembered that competition with other fuels is comparatively recent. We are being attacked from two directions—(1) with cheap B.Th.U.—*i.e.*, oil, &c.—(2) automatic furnaces with expensive energy—*i.e.*, electricity. If we can cope with the latter the former will come as a matter of course, but it is the latter that is to be feared most.

THE DIRECTIONAL REFLECTION OF RADIANT HEAT

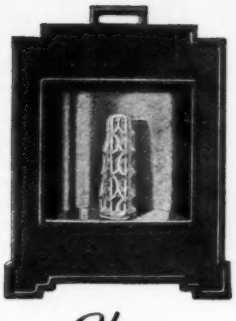


The *New* system of Gas heating *by*

PARKINSON

The
ZONEX
Portable
Gas Fire

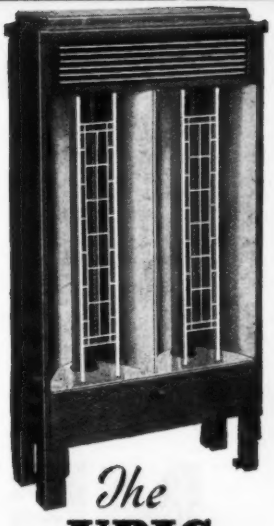
Another triumphant development. The "Zonex" consists of a horizontal chromium reflector, above which is placed a unique heating element of patented all-metal construction embodying special alloys. No breakable refractory material is incorporated. The "Zonex" with its wide horizontal distribution will undoubtedly appeal greatly to consumers and further extend the selling field of gas.



The
PARAVEX
Portable
Gas Fire

The new system of directional radiation, pioneered by Parkinson, was successfully initiated by the "Paravex." This portable gas fire quickly attained immense popularity, and proved to be the most economical and convenient means of providing cosy warmth for any room at will.

Write now
FOR ATTRACTIVE LITERATURE



The
UBIC
Gas Radiator

The introduction of the "Ubic" marks a great step forward in radiator design—the new system of gas heating now provides a radiator which really radiates. The radiant heat is directed where it is wanted—into the room, resulting in more rapid room warming than hitherto obtained by gas radiators.

THE PARKINSON STOVE COMPANY LTD . . . BIRMINGHAM

London Showrooms: Terminal House . Grosvenor Gardens . S.W.1

MEMBER OF THE SOCIETY OF BRITISH GAS INDUSTRIES

REGULO
(Trade Mark)

REGULO-CONTROLLED

NEW WORLD

COOKERS AND RANGES

the simple word that became a symbol!

The national "change-over" to automatic oven-heat control came in 1923. The 'Regulo' made it a complete success.

THE wider the scope of advertising—the more enlightened its application—the greater becomes the power of personal recommendation to make sales. Right from 1923, when the 'New World' Cooker was introduced with the 'Regulo' as the pioneer of automatic heat control, one primary object has possessed the manufacturers. *That object is to maintain the highest possible standard of perfection in workmanship* throughout every detail of construction. No works test has been considered too costly to ensure this maintenance of the goodwill both of Gas Undertaking and Public. For this reason, the 'Regulo' stands alone to-day, as it did literally in 1923, as the most perfect example of consistently accurate automatic oven-heat control.

"From one woman to another," the 'Regulo' is a very real factor in the home to-day. In building this goodwill for Gas Cooking, as a contribution to the Industry's success, Radiation cannot but feel the utmost satisfaction.

Radiation

The
BEACON
(S Series)

The introduction of the "Beacon" S Series has met with widespread approval. It is similar in design to the well-known Cannon "Beacon" Radiator (one of the most popular of this type of heating appliance ever produced), and, like it, has exceptional heating qualities. It has drop-type safety taps and, in addition, complete flame protection. On account of its safety features it is finding a wide market in warehouses, stores, and buildings that are left unattended for long periods yet which require a constant temperature. Full details from—

CANNON IRON FOUNDRIES, LTD., DEEPFIELDS, NR. BILSTON, STAFFS.

Electrical Competition.

Electricity for industrial heating problems has passed through several different phases. It should be remembered that the thermal cost of electricity in bulk at as low as ½d. per unit is at least three times dearer than town gas at average industrial rates; nevertheless the early electric furnaces of ten or more years ago could in some cases compete on fuel cost with the simple gas furnaces which were mostly relics of the War days. The efficiency of these latter furnaces was low, whereas the electric furnace efficiency was very high (85% or more). The result was that about ten years ago electric furnaces came very much to the fore, in fact there was a minor boom, and I have no doubt that a much larger number of electric furnaces would have been sold except for one thing. I refer to the trade depression of seven or eight years ago. Money was tight and trade was bad; nevertheless during this bad spell I was informed by several leading manufacturers that "As soon as trade recovers we shall have more electric furnaces." From this particular point of view the trade depression was very fortunate. It gave the Gas Industry breathing space, and by the time trade had recovered, automatically controlled gas furnaces had been produced, having an efficiency of double and treble their previous values, ultimately reaching the present position—that is, fuel for fuel, modern gas furnaces are considerably cheaper to run than electric furnaces. Nothing would give me greater pleasure than to finish the story here, but unfortunately I cannot in view of some recent experiences. From a thermal standpoint electric furnaces have practically reached their maximum efficiency. Their efficiency is so high that any possible gain can only be achieved at a greater extra capital expenditure, and in any case if we give the electric furnace 100% efficiency, modern gas furnaces still show a saving in fuel cost. But electric furnaces are still being installed, and unless further steps are taken by interested parties, I can foresee many more electric furnaces being used.

There are several contributory factors to this state of affairs, which are as follows:

Although the capital cost of electric furnaces is generally high, with trade in its present prosperous state money is easily available for the purchase of new plant, and manufacturers are prepared to pay the figures asked because of (*a*) the romantic appeal of electricity and the "press the button and it works" feeling which is difficult to repress in these days of the telephone, wireless, &c., and (*b*) the electric furnace manufacturers have introduced plenty of "gadgets" on their furnaces; some are useful, some are redundant.

In my opinion this is where the electric furnace manufacturers have scored; they have studied mechanical handling and conveying mechanisms, and have woven these features into their furnaces in a very clever and practical way. From a mechanical engineering point of view they are a sound job and also look very pleasing. This makes the furnace expensive, but, nowadays, manufacturers are prepared to pay for these features. From my experience in the design of industrial furnaces and equipment, I should say that the electric furnace manufacturers employ engineering designers who are skilled in mechanical handling as distinct from furnace design.

I would like to take the opportunity of asking the gas furnace manufacturers to consider this point very carefully. I know they will say "But customers won't pay for these refinements." While this may have been true in the past, it is a fact nowadays that furnace users have money and are prepared to pay. One assumes of course that the furnace manufacturer will ask a price for the extra gadgets which will show a reasonable profit, a price *for* the gadgets, not because *of* the gadgets.

At the present time the position of gas for industrial heating is very sound. But this is not the time to rest on our oars. How are we going to maintain and increase this load?

Future Progress.

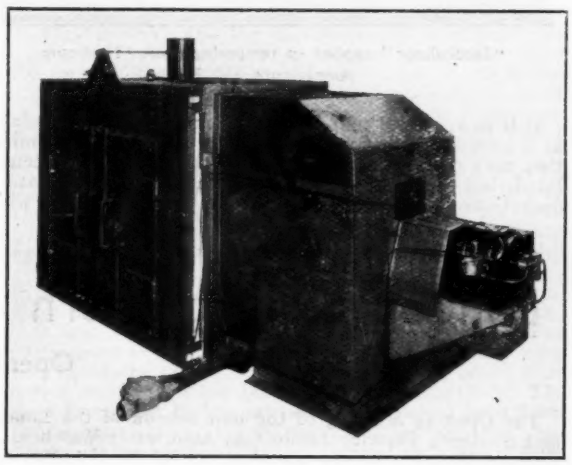
The larger undertakings have spent a considerable amount of time and money developing burners and what I choose to call the smaller appliances, say up to a 3 ft. by 2 ft. by 1 ft. furnace, as any of you may judge when walking through an industrial showroom.

It is the larger appliances and applications which we must study, for here lies our large consumptions. The Press recently has been suggesting research on Industrial matters. Speaking as one who has been associated with research a number of years and with a full knowledge of what research means, while it would be foolish of me to say we do not want any research, what I do say is that there are more important things to be done, which are, however, closely connected with research. I refer to design and experiment. We know a considerable amount about combustion and the application of heat. It is the welding of these items into modern process work that is the trouble. From experience I know that it is practically impossible to carry out these experiments in a laboratory or demonstration room, and the only solution is to carry out experiments and tests in a manufacturer's premises. As far as Birmingham is concerned, we have had the utmost co-operation from our consumers, who are only too pleased to help, ultimately to our mutual development.

Suggestions for the Future.

Taking everything into consideration, in my opinion what is required is first an engineering design staff, backed up by experts in the application of gas to the particular process under consideration at the moment, and secondly a staff of experts aided by a sufficiency of scientific aids to carry out the necessary experiments and tests. It can hardly be expected of any one undertaking to bear the expense of this organization, but the Joint Co-ordination Committee and the Centre Scheme should be able to formulate it on a satisfactory basis. The co-operation of the appliance manufacturers is desired and should be encouraged in such a scheme.

Having thus perfected a piece of apparatus or plant, it should be given the widest publicity in every direction, preferably by demonstrations. The furnace manufacturers, provided they give their co-operation in the first instance, should be given full facilities for manufacture.



High-temperature "Serckulator" applied to stove suitable for aluminium treatment up to 520° C. and also the tempering of steel.

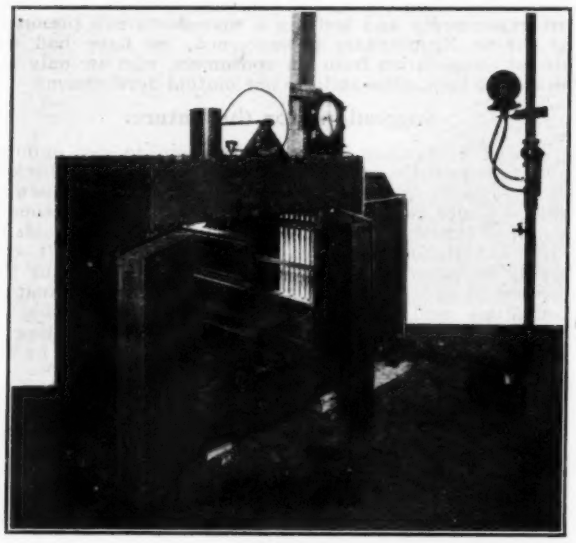
The chief value of such a scheme would be to anticipate the demand. The development of a piece of apparatus would take many months, consequently it is no use waiting for an enquiry. As an example, I have had two similar experiences. In each case a complete conveyor heat-treatment plant was required—*i.e.*, the work to be loaded at one end, passed through the furnace, quenched, tempered, and discharged. In neither case could any of the leading manufacturers put up a complete satisfactory plant. One cannot altogether blame the manufacturers, because of the time and money to be spent on design and experiment; but the electric furnace manufacturers can do it, and that is why I feel so strongly that we ought to do the same.

A New Development.

Before concluding my Address I would like to give you a few notes on a problem on which I have spent some time recently. I refer to the use of heated air. There are several purposes in using heated air—for de-humidifying, for oxidation processes such as paint and enamel drying, core-drying, &c., and to heat up various articles for tempering and heat treatment.

In addition to uniform temperatures, forced circulation gives much more rapid heating. With the apparatus I am about to describe, velocities 50 to 100 times greater than natural convection are attainable. During the last few years large plants have been installed for cycle and motor car enamelling, core drying, tin printing, &c., using heated air and built on the conveyor system. These have been highly successful and are eminently suitable for continuous production on a large scale, but I would like to describe to you a small apparatus made by Messrs. Serck Radiators, Greet, Birmingham, and known as the "Serckulator,"

which has been designed to fill an urgent need for a small unit which can be adapted to a box type oven or furnace, either new or existing.



"Serckulator" applied to tempering oven. Maximum temperature, 650° F.

It is so arranged that the air is continuously recirculated at a high speed through the oven; the products of combustion may or may not be mixed with the air and recirculated, but we have found that with the most delicate of operations, such as bright steel colouring and white enamelling, the products of combustion can be used with perfect safety without discoloration or bloom. It is obvious, of course, that the thermal efficiency is considerably increased by using the combustion products.

The heating unit consists of a battery of tubes heated by a number of burners; the products of combustion pass through the tubes while the air is blown over them by a fan placed behind. After the air has passed through the oven it is drawn back by the fan, picking up the products of combustion on its way, and together they are blown over the tubes, thus completing the cycle. The fan bearing, which is in a very hot position, has presented a difficult problem, but after many experiments a very excellent arrangement has been made. The bearing is oil cooled and lubricated by circulating pumps driven by the motor, one gallon of oil being in circulation the whole time. A safety device is attached to the oil circulation system so that should the oil pressure fail due to shortage of oil or failure of electric current or any other fault causing the stopping of the motor, the gas is automatically cut down to a by-pass consumption.

The whole unit is thermostatically controlled.

By using special heat resisting alloy metals, temperatures of 550° C.-600° C. have been attained.

A test was carried out recently on the treatment of aluminium pistons at 520° C. The treatment was for 6 hours and Brinell tests on each of the 30 pistons and test pieces showed practically no variation.

So far units have been installed and are working in consumers' premises for the drying of fishing rod canes (a very delicate operation where temperature control and uniformity of heating are essential), black and coloured enamelling, core drying, small spring tempering, and colouring, tintack blueing, &c.

In the case of the enamelling stove the one unit has displaced four box type ovens, giving an increased production and a much better finished job than was possible previously.

The units are made in four or five sizes, having maximum outputs of from 1 to 5 therms per hour.

London and Southern District Junior Association

Opening Meeting

The Opening Meeting of the new session of the London and Southern District Junior Gas Association was held on Friday, Oct. 18, at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C. 1. Mr. F. C. SMITH (Gas Light and Coke Company), the retiring President, occupied the chair at the outset.

Before commencing the business of the meeting, the CHAIRMAN asked those present to stand for a moment in respect to the memory of one of the Association's Patrons who had just passed away. He referred to Mr. Thomas Goulden, one of the oldest Directors of the Gas Light and Coke Company. Mr. Smith said that he personally remembered Mr. Goulden for the help and encouragement he had given in the past. He was one of the leaders of the Gas Industry as well as a true friend.

The HON. ASSISTANT SECRETARY (Mr. G. Gardiner, Wandsworth) then read the minutes of the previous meeting, which were confirmed and signed.

The New President.

Mr. SMITH then vacated the chair in favour of the new President (Mr. J. M. Webber, of the Croydon Gas Company), and in doing so he spoke of the pleasant year of office he had had, and paid tribute to the support he had received from the Council and members generally. He was also indebted, he said, to those who had given up so much time to the preparation of the admirable set of Papers that had been read last session. In asking Mr. Webber to take the chair he wished him on behalf of the Association every success during his year of office.

Mr. WEBBER, on taking the chair, thanked Mr. Smith for the kind remarks he had made. Mr. Smith, he said, had made it infinitely more difficult for him to carry out the Presidential Office by reason of the high standard he had set during the past year.

Continuing, the PRESIDENT said that his first duty was probably the happiest he would have to perform during his year of office—namely, the presentation to Mr. Smith of a small memento from the Association in memory of the very happy year they had spent under his Presidency. It did not require any words from him to assure Mr. Smith how much they had enjoyed his year of office, and they would look back upon it as one of the most outstanding years of the Association—and he could only hope that Mr. Smith's own memories would be as happy as theirs.

Mr. SMITH, in accepting the presentation, thanked the members very sincerely, saying that it would remind him always of a very happy year as President of the Association and of many friendships which were very dear to him, as well as of the help he personally had received from the Association.

The Milbourne Medal.

Mr. R. J. MILBOURNE then made the presentation of the Milbourne Medal to Mr. P. F. Scarth, of the Gas Light and Coke Company, for his Paper read last session, entitled "Sales and the Basis of Charge." He first thanked the members for the cordial welcome they had given him and expressed his pleasure at visiting them again. As he knew so many of the members it seemed like coming among friends.

The high standard and quality of the Papers read before this Association, he continued, were, with the subsequent discussions, not only a source of profit and pleasure to the members but equally so to many outside their organization. They gave to all of them who were deeply interested in the welfare of the Gas Industry a feeling of confidence that the future of the Industry would be in capable hands, and clearly showed that the Juniors were fully aware of the needs and opportunities which must be faced now that they had to meet such intensive competition. He considered the potentialities of gas consumption exceptionally good, both in the homes and in commerce and industry. At the present time a great deal of thought and attention was being given to the distribution and selling side of the Industry, and it was generally admitted that this was a detail of vital importance. He was sure that the future prosperity of the Gas Industry would depend in an increasing measure on greater attention being given to the selling and supplying of gas at an attractive price, accompanied by an efficient service which would enable the consumer to obtain the best results at a reasonable price. The service rendered in many cases was, he thought, inadequate to the needs.

With the extreme competition which the Gas Industry had to face from their electrical friends, there was the

strongest possible reason for the putting forward of competitive tariffs to suit local conditions and circumstances; and Mr. Scarth's Paper would be of considerable assistance to all those undertakings which were tackling this important question.

Results of Tariff at Wellington.

Mr. Milbourne went on to give a number of interesting particulars of the results obtained at Wellington (Salop), after putting into operation a two-part tariff which they offered to their consumers on Jan. 1, 1931. He mentioned that the Wellington Company was the first gas company to introduce an optional two-part tariff. The number of consumers who adopted the tariff was 119, or about 13%. The tariff was not favoured by prepayment consumers, who preferred cash discounts on the quantity of gas consumed. The following figures showed the amount of gas sold to domestic consumers on the two-part tariff over four years:

1931	14,507 therms
1932	28,433 ,,
1933	39,868 ,,
1934	49,132 ,,

Increase, 240%

The average consumption per consumer on the two-part tariff was, at Dec. 31, 1934, 413 therms, while the average consumption per ordinary domestic consumer prior to the introduction of the tariff was 147 therms. The average consumption of all ordinary domestic consumers at Dec. 31, 1934, was 205 therms, showing an increase of 58 therms, or 13,000 cu.ft.

In conclusion, he handed the Milbourne Medal to Mr. Scarth and congratulated him upon his success, remarking that the last word in increasing the sales of gas would be said in the sphere of an attractive tariff to the consumer, rather than in that of propaganda, and he was sure that Mr. Scarth's Paper was a very useful contribution on this important subject.

Mr. P. F. SCARTH, in accepting the Medal, thanked the Council for the compliment they had paid him in awarding him the Milbourne Medal for his Paper and Mr. Milbourne for the honour he had done him first as the generous donor of the Medal and secondly for presenting it personally. After he had read his Paper he felt that the amount of interest it created had fully rewarded him for his efforts.

Mr. Webber then delivered his Presidential Address, which will be found on other pages of this issue.

Scottish Junior Association Visit London

Guests of Thomas Glover & Co., Ltd.

A splendid gathering of over one hundred strong left Glasgow late on Friday evening, Oct. 18, to travel all through the night to London where, what proved to be a full but delightful day, awaited them. This enthusiastic party, composed of members of the Eastern and Western Districts of the Scottish Junior Gas Association, arrived at Euston at 7.30 a.m. after a very pleasant journey.

Breakfast over, the party travelled by motor coaches to the Gothic Works, Edmonton, where Messrs. Thomas Glover & Co., Ltd., carry on the manufacture of their well-known meters under ideal conditions both as regards production and the comfort of their employees. This great Firm moved to Edmonton in 1899 when production outstripped accommodation at Clerkenwell. Ever since that date the Works have been extended bay by bay until at the present time the combined factories of Thomas Glover and R. & A. Main, Ltd., with whom the former amalgamated in 1897, cover over thirteen acres. When the Gothic Works were built the ground plan was considered with an eye to the future. The original shop area was 61,950 sq.ft. as against 536,540 sq.ft. to-day. Thirty-six years ago the 19-acre site seemed sufficient for all future requirements but a further 1½ acres have recently been leased from the Tottenham and District Gas Company.

Although three hours were spent in touring the works it seemed all too short, and the guides had a very busy time explaining the methods employed and answering pertinent questions. Everywhere we went we met with orderly and efficient methods. The meter assembly shop, popularly known as the "Tin Shop," is a perfect example of a mass-production building. The excellent lighting, spaciousness, cleanliness, and purity of atmosphere are typical of present-day factory planning. The purity of atmosphere is maintained by an air conditioning and central heating plant worked primarily from two Spencer-Bonecourt gas-fired boilers, thermostatically controlled. The heat from these boilers is distributed into the various departments by unit heaters designed to maintain a temperature of 60° F. when the outside temperature is 32° F. The correct inside temperature is maintained by automatic controls. These units are capable of introducing 20,000 cu.ft. of fresh filtered air per minute, and it is this work in conjunction with the exhausting plant that removes the fumes from the tinmen's firepots. The complete absence of anything approaching foul gases proves the high efficiency of this installation.

Certain benches in the "Tin Shop" are set aside for repairs to every type of meter. Here only men who for many years have specialized in this class of work are employed. One bay, the full length of the shop, giving as great accessibility as possible, has been set apart for proving by means of modern plant all classes of meters. This work of proving is carried out only by experts. The importance of temperature has been appreciated in this department as was apparent from the judicious placing of the holders and the perfect ventilation. All parts awaiting issue to the shops are stored in steel bins of the latest pattern and every step has been taken to ensure speed of handling in the issue of sets of components.

In the brass shop girls are employed in the assembly of movement parts, and all down the main aisle up-to-date machinery is producing the multitudinous brass parts for various sizes of meters. Here the layout has been planned to ensure that every machine aids in the continuity of the flow of production. Next we came to the tool room where are housed all the tools, jigs, and gauges used in the construction of a meter from the stamping out of the casing to the smallest component part of an index. Some very impressive machinery was to be seen in the press shop including light and heavy presses of various kinds, folding machines, and guillotines. Here all case parts for ordinary and prepayment meters are produced. Members also noted that here the manufacture of street lanterns is carried on.

Perhaps not quite so spectacular, but nevertheless important in the production of first-class meters, are the leather and valve grinding shops. Messrs. Glover-Mains are very good friends of the Gas Industry whom they have served faithfully for so many years, and we noted that wherever possible gas has been utilized at Edmonton. The Spencer-Bonecourt boilers previously mentioned burn 7,000 cu.ft. an hour during the wintertime. In 1934, the consumption of the associated firms totalled over 84¼ million cu.ft. This has been made possible, state the firms, by the active co-operation of the Tottenham and District Gas Company, whose supply is brought in from their Willoughby Lane Works in three mains. Two gas engines of 200 h.p. each coupled to Crompton generators each of 126 kW output provide the necessary electric power.

It is interesting to note that meter No. 1, still in working order, is now in honourable retirement, while the day is not far distant now when the three-millionth meter will leave the Gothic Works.

Luncheon and Tour of City and West End.

An excellent lunch was kindly provided by the Directors of Messrs. Thomas Glover at the Roebuck Hotel, Buckhurst Hill, on the fringe of Epping Forest. The Loyal Toast having been honoured, the Chairman, Col. WILLIAM R. GLOVER, C.M.G., D.S.O., T.D., Managing Director, who was received with acclamation, welcomed the Associations in a few happy words. Despite the well-known quotation of Kipling, he thought the gathering at the luncheon a very good mixture of east and west. He was sorry that they had not had more time to spend at the Gothic Works but the Firm had shown them what they could in the time at their disposal and, he added amid laughter, if they had inspected all the 280 parts that went to make a meter they would still have been at the Works.

The President of the Western District, Mr. ARTHUR J. DORAN, said that he was rather sorry that Mr. Bujnowski had not been the first to speak for he felt totally unable to find words with which to express adequately their great debt of gratitude to Messrs. Thomas Glover. That day they had seen the finest works in the country, and that privilege the Juniors had fully appreciated. They had all been staggered with the magnificence of it all, and found it very difficult to thank Col. Glover. Perhaps, some measure of their appreciation might be gauged from the fact that the number from the Western District present was greater than the average turn-out at their meetings. They also

owed Mr. Samuel Hall, of Messrs. Glovers, a debt of gratitude for introducing the visit to the Juniors early last spring. Ever since that time they had been looking forward to it.

On behalf of the Eastern Juniors, Mr. ALEX BUJNOWSKI, the President, thanked Col. Glover heartily, and went on to observe that it was the first occasion on which they had paid a visit outside their own country. They had been pleased and proud to visit the Works, and, like the Western District, they had a greater attendance than the average for their meetings. What they had anticipated had been realized to the fullest and, although he had visited the Works twice before, he would very much like to go again. One of the first features that struck him was the marvellous layout of the Works and the excellent conditions under which the workers fulfilled their duties. They might well have been manufacturing foodstuffs. In conclusion, Mr. Bujnowski asked the Associations to join with him in drinking the health of Messrs. Thomas Glover coupled with the name of Col. Glover. This toast was accorded musical honours, and briefly replied to by Col. Glover.

The party then left by coaches for a tour of the City and West End which was followed by high tea at the Charing Cross Hotel by kind invitation of Messrs. Thomas Glover. "Auld Lang Syne" concluded the official programme which had been strictly adhered to throughout the day, and groups hurried off hither and thither to wind up what was voted by all to have been a most successful and enjoyable day with a taste of the night-life of London before catching the last train back to Scotland.

A Practical Jubilee Gift

Before—

—and After.

The Cirencester Gas Company's Jubilee Gift to the town could scarcely have taken a more practical or beneficial form than the presentation of new gas lamps in the Market Place. That the gift has made a very notable improvement in the illumination will be appreciated from the above photographs, taken from the same spot before and after the change over.

The new lamps erected in Cirencester Market Place were formally presented to the Urban District Council at the Municipal Offices, where there was a gathering of the members and officers of the Urban District Council and of the Chairman, Directors, shareholders, and officials of the Cirencester Gas Company.

Mr. R. J. Mullings, opening the proceedings at the request of Mr. Winstone, said collectively the Directors were rather a retiring body, and they had not sought the publicity being given them. But they felt, when the Council extended an invitation to come there and publicly hand over the lamps erected in the Market Place, that it would be ungracious not to accept, especially as the Council felt it to be rather a command performance.

For some years the Directors had been considering the question of the improvement of the lighting of the Market Place, and their Engineer, Mr. Cleator, from time to time had got out schemes and put before them. They thought that this year of Jubilee was a fitting occasion on which they might satisfy Mr. Cleator's ambitions and also present to the town, as the Gas Company's contribution towards the commemoration of Their Majesties' Silver Jubilee some new lamps for the Market Place.

The lamps were the latest form of low-pressure equipment, designed to give 600 candle power, and, as there were eight of them, by a simple mathematical calculation, the Company were giving them the lighting of 4,800 candles. The relations between the Gas Company and the Council had always been, he was glad to say, cordial and friendly, and he trusted they always would be so. Their aim was to give the best possible article at the lowest possible price. On behalf of the Directors and shareholders of the Gas Company he asked the Council formally to accept the lamps.

Mr. Winstone, in accepting the lamps, mentioned in the public interest that if the cash value of the Jubilee gift was added to the public subscriptions for the Jubilee celebration in Cirencester the grand total would amount to over £600. That in itself, for a town of that size, was a very creditable effort, and the money, he thought, was well expended. He asked Mr. Mullings and the Directors of the Gas Company to accept the very cordial thanks, not only of the Urban Council, but of the Jubilee Committee and the ratepayers of Cirencester. He thanked them not only for the gift, but also for the public spirit shown in the giving.

At the invitation of the Gas Company the party then adjourned to the King's Head Hotel Assembly Rooms for light refreshments. During their progress the old lamps were extinguished and the new lamps lighted, so that they were able, with the large crowd assembled in the Market Place, to note the improvement.

Before they separated Mr. A. J. Matthews thanked the Directors of the Gas Company for their hospitality, his remarks being responded to by Mr. E. A. Jefferies on behalf of the Directors.

★

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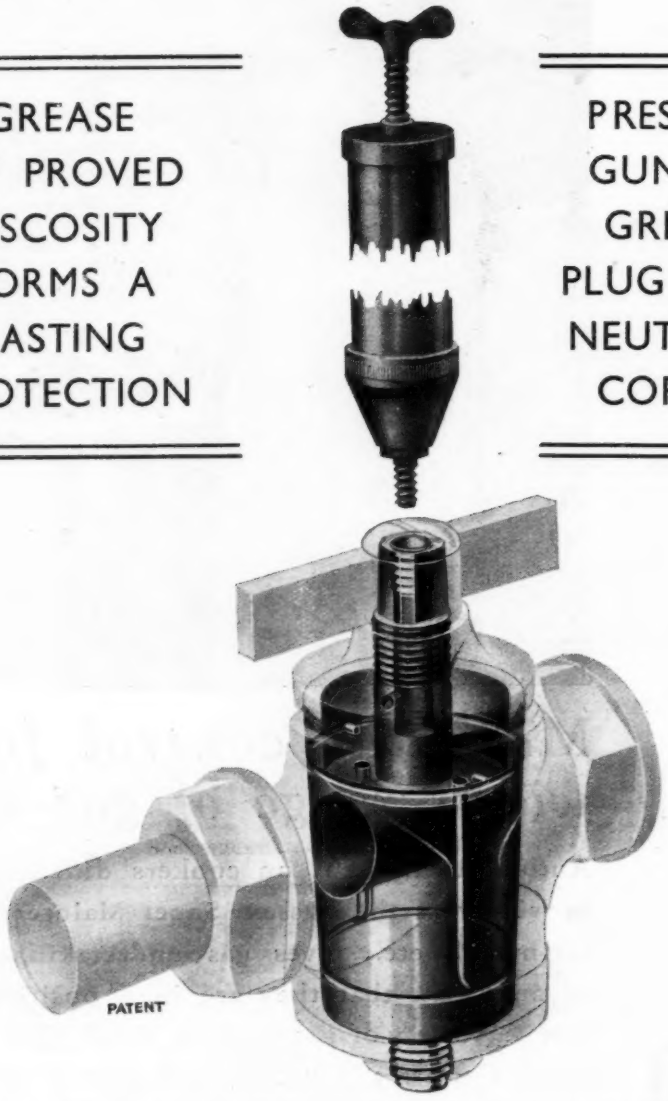

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SAMPLES AND PRICES ON APPLICATION

LONDON AND SOUTHERN DISTRICT JUNIOR ASSOCIATION

THE PRESIDENT.

Presidential Address

OF

J. M. WEBBER

(of the Croydon Gas Company)

Read at the Opening Meeting of the Association held in London on Friday, Oct. 18.

Mr. Webber's Address included nine Appendices consisting of specimens of the types of form used in the Croydon Costing System. We have omitted the Author's references to them —this, however, without detracting from his main argument.

A Definition of the Engineer.

We are all familiar with the finest definition of an Engineer that was ever written. "An engineer is a man who can do for one shilling what any fool can do for two." I cannot help feeling that all those who are engaged in running a works should always have this commercial aspect in their minds rather than strain after so-called efficiencies which may if carefully examined prove uneconomical. One may find instances of particular plants which are being worked at a very high state of efficiency in the narrow meaning of the word, while at the same time the process as a whole is showing little or no profit and a radical change of method, either by cutting out the process altogether or by installing new and more economical plant, is urgently required.

I would venture to suggest that the gas engineer of the future will have to devote much more attention to the economics of gas manufacture. Modern gas-works plant becomes more and more reliable and there would appear to be a belief among the leaders of the Industry that no spectacular changes of method are probable for some years, progress rather being directed to bringing old equipment up to present-day standards. It is to be hoped, therefore, that these circumstances will afford a respite from technical worries which may with advantage be devoted to a closer study of economical production.

Costing Systems for Gas-Works.

In his Presidential Address to the Eastern Counties Gas Managers' Association in 1933, my Chief, Mr. Walter Grogono, made an appeal for some standardization of costing systems on gas-works and described briefly the method employed at Croydon. With his permission, I propose to describe this system in rather greater detail in the hope that it may stimulate a more general interest in this subject.

May I first lay stress on what appear to me to be the two fundamental rules to remember. First, no costing system in any industry is completely accurate. No matter how many codes and sub-codes are created there will always be loopholes and there will always be times when a little imagination must be used in deciding exactly how to deal with unusual charges. All such systems cost money, and if the scheme is taken beyond a certain reasonable completeness the cost soars up until the method defeats its own object.

Secondly, the whole object of a costing scheme is to obtain information quickly. It is no use whatever discovering at the end of a year that several thousand pounds have been needlessly spent on the works. The costing system is only justified if it makes this source of loss apparent at the end of a week or a month so that prompt action can be taken. The rate at which money can be lost by imperfect control of a large works is amazing. Consider for a moment a typical works producing coal gas in vertical retorts, with steaming, water gas, and benzole. The question of co-ordinating these plants to suit varying demands and prices for coal, gas, coke, oil, and benzole is exceedingly complex and conditions may change almost daily. It is hopeless to try to obtain the best financial results unless accurate costs of processes and material are available at short intervals.

Carbonizing Results and Works Costs.

Broadly speaking, a cost expressed as a lump sum of money is of little use to the gas engineer in planning his schedules. He requires costs per therm, per ton, and per gallon, and so two systems are essential. First he must know technical results such as the quantities of coal used and gas made. Then he requires the total costs of all materials and processes. By combining the two types of information the required result is obtained. I will endeavour to describe how this information is collected and used at Croydon and I would like to make it quite clear that a large part of this system is based on methods originally developed by the Gas Light and Coke Company which have been modified and extended where necessary to suit our local conditions.

Manufacturing Statements.

The first stage in the preparation of manufacturing data is the Daily Record of Manufacture. This is a large book which is kept in a meter house on the works. It has a double page opening for each day in the year, while each page is divided into twenty-four hours commencing at 6 a.m. Entries are made in this book at hourly intervals through the day and night, chiefly by assistant governor house attendants, of the following:

Indices of all station meters on coal gas, water gas, and mixed gas streams together with meter temperatures and pressures; hourly makes of each stream; individual and total holder stocks at works; working of holders; consumption of gas; calorific values of all streams and mixed gas at inlet and outlet (official recorder) of holders; oil flows through benzole washers; sundry details such as air to purifiers, oil used per run at C.W.G. plant, &c.

Thus the Assistant Engineer responsible for controlling stocks can see the position hourly.

Each morning after 6 a.m. all totals are added up and essential figures are abstracted and sent to the office. Hopper stocks of coal and coke, together with details of coal received the previous day are also sent to the carbonizing office by 8.30 a.m. The carbonizing clerk then sets to work on these and other figures, and by 9.30 a.m. has prepared: All makes of gas corrected to 60° F. and 30 in. Hg; total consumption of gas, using corrected makes; de-

tails of varieties and quantities of coal carbonized in each retort house; therms and cubic feet made per ton of coal; throughputs; working results at C.W.G. plant; make of benzole; comparison of the day's consumption and temperatures with the corresponding day of the two preceding years.

He then enters certain of these figures on sheets which are at once handed to the Engineer, while corrected makes and consumptions, details of coal and carbonizing results, &c., are entered in appropriate spaces in the Daily Record of Manufacture for the information of carbonizing foremen.

It is important to note that all the chief results of the previous day's working are available early the following morning.

We then pass to the Manufacturing Statement Book. This is kept in the carbonizing office and contains a double page opening for each fortnight. The book contains enough pages for one year. The carbonizing clerk now enters nearly all the figures he has prepared in this book but deals only with corrected figures for gas, while holder stocks are entered as total stocks at the end of each week. The Company consider each week as beginning at 6 a.m. on Wednesday morning, and on that morning, after entering the daily figures, all the totals and week's results are worked out. Space precludes any detailed mention in this description of figures relating to tar, liquor, sulphate, &c., but these are dealt with and makes, stocks, &c., are entered weekly.

It will now be seen that the important Monthly Manufacturing Statement is readily prepared by merely adding the totals of the weeks and odd days from the Manufacturing Statement Book and working out the results. This monthly statement gives all the particulars normally required relating to the running of the works during that period, and it is this return that is used later in the preparation of works costs.

A number of other returns are prepared including a Daily Laboratory Report giving details of all work, analyses, &c., carried out by that department.

It may be mentioned that small calculating machines are employed at the works, and these speed up the process enormously and cut out much of the drudgery of preparing figures.

The greater part of the work in connection with the preparation of works returns and costs is done in the offices at the works. The staff here is responsible for collecting information from various sources through a system of forms and comprises chief clerk, chief clerk's assistant, two carbonizing clerks, timekeeper and three assistants, two stores clerks, and two typists.

The General Office at the works may be regarded as the point to which all information eventually comes and whence all final returns emanate. It should be emphasized, however, that the Secretary's Department at Head Office co-operate in running the costing scheme and arrange for it to be audited regularly.

The Costing System.

Having seen how the technical figures are obtained we can now examine the system by which costs are prepared.

A code number is allocated to every plant and process on the works. Persons responsible for the coding of labour and materials are provided with a "Schedule of Codes" and are notified at once when any amendments are made. Revised lists are issued from time to time.

Sub-Codes.

For greater accuracy in analysis many of the Codes are divided into sub-codes. Thus, No. 1 Retort House, for example, comes under Code No. 1 with the following sub-codes: Code 1/1 Retort House building and lobbies; 1/2 stoking plant; 1/3 coal handling plant; 1/4 retort fittings; 1/5 hydraulic mains; 1/6 beds; 1/7 furnaces; 1/8 retorts; 1/9 coke handling plant.

These sub-code numbers are common to all retort houses. Code 4/7, for instance, would denote Furnaces in No. 4 Retort House.

Care is taken to avoid creating too many codes covering minor details. For example, on a large works little useful purpose would result from allocating a separate code to every tank on the works, while the system as a whole would become unwieldy. These are all grouped under one heading—Tanks (Fixed) for Tar, Liquor, Water, Oil, and should the month's bookings under this code seem excessive it is not difficult to investigate further and find the cause.

The Schedule of Codes is divided into three sections. To avoid any misunderstanding in booking, and to allow for future extensions of the system, each section has its own range of code numbers. A great deal of care was taken in compiling this Schedule and the fullest possible details are given under each code.

Section 1. Wear and Tear.

All charges in connection with the upkeep of the works, maintenance of plant and buildings, overhauls, &c., are booked to codes in this section.

Section 2. Manufacture.

This heading includes all charges in connection with coal, coke, purification, water gas, residuals, &c. It deals chiefly with handling and labour charges, and definitions are included showing where each charge begins and ends. For example, under Code 100—Coal, we find—

"Charges in connection with the unloading and conveyance of coal from railway trucks to hoppers above charging machines, also storage and conveyance of coal for use on works"; while under Code 101—Coke, appears the definition "Charges commence after coke has been removed from retort house and deposited in hopper or on heap. The following operations are included: Spreading outside retort house, inspecting, storing, screening, weighing, and delivery to works or customers' vehicles."

Beneath each code is printed a list of the classes of labour to be included, such as coal foremen, locomotive men, crane drivers, &c.

Section 3. Special Expenditure.

This section is reserved for work which is to be charged to Capital or Renewals account—*i.e.*, extensions to plant, resetting in retort houses, or any special work being undertaken. These codes are only in use while the work is in progress, being opened when the job is commenced and closed as soon as the work is finished. In this way the accurate prime cost is obtained, any subsequent charges which may arise due to upkeep or manufacture being booked to appropriate Wear and Tear or Manufacture codes.

The Use of the Coding System.

(*a*) *By Those on the Works.*

Labour.—All foremen prepare Occupation Books daily showing how each of their men has occupied the day. Code numbers are placed against the entries of time and the books are sent to the timekeeper's office daily where the labour is costed and entered on the Wages Sheets, the Occupation Books being returned to the foremen in the afternoon. The actual time worked daily by each man is confirmed by a system of checks at the works gates. At the end of the month the charges so obtained are entered in the Code Book which will be described in detail later.

Material.—No material can be obtained from the stores except by the presentation of an order signed by the foreman. This bears a full description of the nature and quantity of the material needed, together with a code number signifying the plant it is to be charged against. These orders, after being signed by the drawer, are forwarded to the Secretary's Department at the Chief Office, where the materials are costed. This office enters the monthly totals of labour and materials into the Cost Code Book under the appropriate codes. The book is then returned to the works.

It will be noted that no labour or material used on a job can escape the notice of the foreman, as he has to make out Occupation Books and orders, while no material can be issued from the stores without authority.

(*b*) *By Those Responsible for Preparing Works Costs.*

We have seen that all costs of material and labour are entered in the Cost Code Book monthly under the correct codes. In this book is a vertical column for each code. The column is divided horizontally into spaces for each month. In each of these spaces appear five figures, thus:

—	£	s.	d.
Labour			
Direct charges			
Material			
Total for month			
Accumulating total . . .			

It should be explained that the expression "Direct Charges" refers to items such as "Coke used at Water Gas Plant," for instance, or materials which cannot pass through the stores.

These figures are usually completed by approximately the tenth day of the following month. Thus, by glancing at the totals, those responsible for directing the works can readily see how the costs are working out on any plant or job with the shortest possible delay. The costing staff at

the works is already in possession of the month's technical results as shown by the Monthly Manufacturing Statement and by picking out the totals of the necessary codes the Cost of Gas into Holder return can be prepared.

Cost of Gas into Holder.

This return is prepared monthly, half yearly, and yearly and is probably the most valuable product of the costing system, as all works manufacturing policy is influenced by the figures so obtained.

Cost of Raw Materials.

Coal.—An average price per ton is obtained for reference by multiplying the tonnage of each variety used during the month by the price (including carriage) ruling for that particular coal. The total sum arrived at is then divided by the total tonnage. The figures are costs of raw coal only. The labour charges in handling are dealt with later under the heading "Carbonizing Wages."

Residuals.—Care is necessary in dealing with these owing to the way in which sales fluctuate in different seasons. To take coke as an example, if sales in the summer are below the quantity made, the revenue obtained by the Company is reduced. It is obviously unfair to penalize the producing plant for this and the following method is adopted for all residuals. The expenses incurred in the production of the residual are extracted from the Cost Code Book. These, together with transport charges, &c., are deducted from the gross revenue received for the month. This amount is divided by the total quantity sold and an average price arrived at. The quantity made for sale (but not necessarily sold), including that used on works, is then multiplied by this figure and a total sum obtained. By dividing this by the volume of gas and the therms made, the credits per 1,000 cu.ft. and per therm are found. This method is admittedly a convention, but it is difficult to see a better way of dealing with the matter and it works out remarkably well over a year.

Coke and Oil Used.—The price charged for coke used at the water gas plant is based on the current price of large coke which would be charged to a customer taking approximately the same tonnage. This rate is fixed for a period of six months and then reviewed. In our case no labour charges are incurred in sending coke to the plant as a belt conveyor carries it directly from the coke screens to the water gas plant. The cost of oil used is simply arrived at by multiplying the price per gallon (including carriage) by the number of gallons used.

Other Charges.

Wages.—We have already examined the system of codes by means of which we can extract from the Cost Code Book all Manufacturing Wages by selecting the appropriate headings. The exact limits of a definition such as "Wages —Carbonizing" are very carefully laid down to ensure uniformity.

Wear and Tear.—A word is necessary as to the method of dealing with these charges. When the "Cost Into Holder" return is being prepared all the wear and tear codes in the Cost Code Book are examined and the charges are picked out. Such an item as Code 1/2, which signifies Stoking Plant in No. 1 Retort House, is obviously chargeable to coal gas, but cases occur which have to be dealt with specially. Code 29, for example, embraces all charges in connection with loading and unloading stores and in this and a number of other instances it is quite impossible to allocate the correct proportions to coal gas and water gas. In these cases the total amount is divided *pro rata* according to the percentages of coal and water gas made during the month. This again is a convention, but is the only way of dealing with the problem.

Sundry Materials.—Fuel to Boilers is priced on the same principles as coke used at Water Gas Plant.

Gas Used on Works is charged at the cost into holder for the preceding month.

Electricity and Water require no explanation, but it should be mentioned that Power Returns are prepared monthly which give full details of all Water, Electricity, Direct Fired Steam, and Waste Heat Steam. All amounts purchased, produced, and used, with full costs, are shown on these returns, which are a valuable aid when estimating the cost of processes.

It will be seen that not only can the cost of a complete process be found, but that the costs of a small item of plant or of raw materials are at once available by the use of the Costing System.

It should be pointed out that as the Cost into Holder return is chiefly intended to give comparative costs for works purposes no capital and renewal charges, rates, &c., are included, but are dealt with separately.

Works and Distribution Charges.

Companies vary their conceptions of where the line should be drawn between manufacturing charges and distribution charges such as Boosting, Governing, &c. We have a definite system of dealing with these at Croydon, but as far as an individual company is concerned, the division is of little importance as long as the same system is always used.

System for Works General Stores.

In discussing the Costing System a number of references were made to the Stores. It will be appreciated that on a large works the cost of general stores is a considerable item, and every effort has been made to devise a system which ensures that this department shall be run as efficiently as possible. It is felt, therefore, that a description of the Costing System would be incomplete without a brief outline of the method adopted.

General Arrangement of Stores.—The bins and racks are arranged in groups, each of which is identified by a large label bearing a block letter. Every bin and rack is separately numbered and labelled with a description of the articles contained. It will be seen that this system of letters and numbers permits of any expansion of any section without dislocating other groups.

Requisitions for Stores.—A small book arranged in duplicate is kept by assistant engineers, foremen, &c., for requisitioning material which is not automatically stocked and must therefore be obtained specially. The detachable leaves bear full details of the articles required, makers' name, code number, &c., and are sent to the storekeeper. Abstracts of these requisitions are entered by him each morning on a form, together with details of any ordinary stores he may require to maintain his stocks. When the form has been approved and signed by the Engineer, the goods are ordered by the Office. It should be noted that when the articles arrive they can only be withdrawn from stock by presenting a Stores Order.

Stores Orders.—Holders of "Requisition for Stores" books also have a small book of Stores Orders. These are arranged in duplicate. The original copy, bearing a description of the goods, quantities, and code number is sent to the stores and the articles are then issued, the order being signed by the drawer. The order then passes to the Stores Office for entry on the Stores Cards and finally to Head Office for costing, the amounts being entered under appropriate codes in the Cost Code Book.

Having examined the system by which goods are purchased and issued for use, we may pass to the Card Indexing System by which a complete record is kept of all stores received and issued and the exact stock of any article is shown.

Stores Cards.—All the bins and racks in the stores are represented by similarly grouped and numbered cards kept in the Stores Office. This card is divided into the following columns: (*a*) Goods Ordered; (*b*) Goods Received; (*c*) Goods Issued; (*d*) Goods Stocked.

The working of the system will be made clear by following the progress of an order. The General Office order the goods and send a carbon copy of the order to the Stores Office who enter the details under "Goods Ordered." The storekeeper is responsible for returning by 9 a.m. each morning a "Goods Receipt Voucher" giving details of all goods received the previous day. These particulars are entered on the proper cards and we can at once check the quantities, &c., received with those ordered. If the details check correctly, the order number in the first section is crossed through in red, signifying that the order has been correctly carried through.

All stores orders pass to the Stores Office after the goods have been issued and details of the issues are entered in the "Issue" section of the card. By subtracting "Issues" from "Stock" the correct stock is shown at a glance in the end column and can be compared with the maximum and minimum permissible stocks shown at the top of the card.

It will be seen that by going to a cabinet and selecting a card complete information as to frequency of ordering, source of supply, issues, and stock are at once available for any article stocked. In the case of general stores, reordering is done by periodical inspection of the cards.

The whole of the system is subjected to regular stock-taking and auditing by the Secretary's Department.

Use of the Costing System by Those in Control of Works Policy.

It is, I hope, unnecessary to say very much about the use of the system I have tried to outline. The means must be justified by the end, and unless each figure that is revealed is reviewed and used in co-ordinating the processes involved the whole system avails but little. If advantage is

taken of the information obtained, however, I am quite sure that results can be achieved which will be far in advance of those obtainable without it.

Some years ago, when the Costing System had become firmly established at Croydon, it was thought that it would be of advantage to collect all the principal data arrived at in one volume, so that any ordinary question connected with the works results could be answered in a few moments without the need of consulting various returns. Accordingly, a Works Report is prepared for the June half-year and the complete year. These reports consist of about 50 pages and are produced and bound at the works. They have proved of the greatest assistance.

To summarize, I would suggest that the following advantages may be gained by the use of an efficient Costing System with a carefully planned stores organization:

(1) Those in immediate charge of work are automatically informed as to the amount of labour and material being used on each job since they have to make out the time sheets and Stores Requisitions.
(2) Technical results are available with the minimum delay enabling those in charge of retort houses, &c., to check results and remedy defects promptly.
(3) Owing to the close check kept on material and labour any unauthorized work or issue of stores is practically impossible.
(4) The knowledge that costs are being investigated continuously tends to encourage economy in all departments, especially when credit is given for economical working so discovered.
(5) Stocks of material are kept at a constant and predetermined level, obviating waste due to excessive stocking and the inconvenience and indirect expense which occur when a badly wanted article is out of stock.
(6) Those who are responsible for determining works policy have available recent and accurate figures on which to base their plans. More accurate estimating of manufacturing and other costs is possible by reference to records of past working.
(7) Excessive costs are brought to notice quickly so that losses may be detected early and remedied before great harm is done.
(8) If only a definite Costing System could be adopted among gas undertakings an interchange of valuable information would be possible with great benefit to all parties.

Vote of Thanks.

Mr. R. Summerson (Luton), the Senior Vice-President, proposed a hearty vote of thanks to their President for his very clear exposition of the Croydon Gas Company's costing system. He would imagine that these costing books formed the Chief Engineer's "Bible," to which he turned for inspiration, information, and consolation. The Association was to be congratulated in having this information placed before it. The average Junior concerned himself far too much with technical efficiency rather than commercial efficiency which was the more important consideration. This could only be effected by a proper costing system and by ensuring that the results of the system were communicated to all the Juniors concerned. In Mr. Summerson's opinion, the chief value of a costing system lay in enabling the management to plan policy. The co-ordination of various plant according to changing demands and prices was a very complex business, particularly if one was endeavouring to produce a gas of constant specific gravity. Engineers would have to devote more and more time to gas-works management in addition to works technique, and the suggestion of Mr. Grogono that The Institution of Gas Engineers should form a committee to consider the standardization of methods of costing was a very valuable one. It would first be necessary for technical results to be reviewed on a strictly comparable basis, and to this end all technical tests should be standardized. He would like to suggest that at some future date The Institution of Gas Engineers could usefully form a committee with the object of standardizing plant testing. Their Association, therefore, was to be congratulated in having this subject brought before them, because they had recently had a Paper on gas tariffs and another on the testing of stores; now they had this Address on general costing methods. This could be correlated by Juniors in their studies with great benefit to them all.

Mr. A. Tennant (Croydon) seconded the vote of thanks to the President for his very able Address. He thought they would agree with him that Mr. Webber had entered upon his year of office in a manner which reflected great credit upon himself and the Association. They were very fortunate in having him as their President. His Address contained a fund of valuable information, and he was sure it would prove a very useful work of reference as well as a most important contribution to the Transactions of the Association. He would also like to compliment Mr. Webber and his colleagues on the manner in which the copies of the Address had been submitted to them. It reflected very favourably upon the efficient organization in the Croydon Company. He thought he was right in saying that this was the first occasion a President of their Association had been enlisted from the Croydon Gas Company, and they would all look forward to visiting the works and seeing the system he had so ably described in his Address. They would all support him in repeating Mr. Smith's wishes to Mr. Webber for a very happy and successful year of office.

The President, in acknowledging the vote of thanks, expressed appreciation of the kind remarks that had been made and especially those in connection with the production of the copies of his Address, which was done by his colleagues in the office, to whom he was very grateful. The subject of costing was, he considered, of the greatest importance to the engineers of to-day and to-morrow. If his Address had shed the slightest light on the subject he was amply repaid.

Mr. W. Grogono (Chief Engineer to the Croydon Gas Company) apologized for the absence of Mr. W. J. Sandeman, his General Manager, who until the last moment had intended to be present, but had been called away to an important meeting. Mr. Grogono went on to congratulate Mr. Webber very heartily on his pluck on reading an Address, the subject of which at first sight might appear to be a dry one. But he really had hit upon a subject which was of the greatest importance. If they knew how much money this system had saved the Croydon Gas Company they would be surprised—and this simply in small ways which had never been brought to light before. One of the features of a scheme of this kind was that it brought outside departments into touch with the works, and they reached a position where it was possible to have things checked by people who knew nothing about them. The Secretary's office sent people to the time-keeper's office and to the stores for this purpose and it was comforting to feel that someone outside was keeping a check on everything. It gave a feeling of security. So far as the work involved was concerned, continued Mr. Grogono, they had not increased their staff in any way in order to operate the scheme, except that the Secretary's office had been augmented by a small costing office consisting of three girls, who dealt with all the costing of materials. All details were recorded both in the Secretary's office and at the works. The works report to which Mr. Webber had referred had really become a works "Bible," and was the most useful record he had ever had. By this means it was possible to trace operations back for six years.

The "Vogue" Series of General Gas Fires

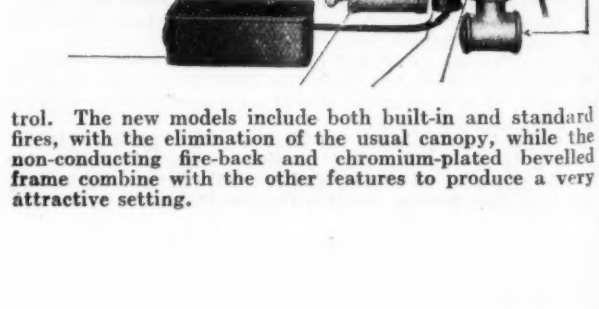
Switch Control Incorporated in New Models

Still another well-known firm of gas appliance manufacturers has responded in their new season's gas fire models to the ever-growing demand for automatic ignition on gas apparatus.

This further sign of the times is a welcome feature of the latest "Vogue" series of gas fires by General Gas Appliances, Ltd., of Audenshaw, Manchester, and adds another valuable selling point to this attractive range of gas fires, which is already notable for its advanced design of "Magna-Plus" curved radiants whose increased length is claimed to give greatly increased radiant efficiency.

The new "Vogue" fire, which is available in a number of pleasing finishes, incorporates several interesting features, including a burner with patent silencer and switch-controlled ignition, conveniently operated from a switch set in the *top* of the fire, thus obviating the necessity not only for matches but also for stooping to light the fire. The burner is fitted either with by-pass ignition or with the added refinement of battery controlled pilot as desired. The whole mechanism is clearly illustrated in the accompanying photograph.

A striking advance in gas burner construction has been achieved by the addition, for the first time, of a patented sound absorber to the burner, while the injector is fitted with the latest type of gas adjustment and pressure control. The new models include both built-in and standard fires, with the elimination of the usual canopy, while the non-conducting fire-back and chromium-plated bevelled frame combine with the other features to produce a very attractive setting.



LONG SERVICE TO THE GAS INDUSTRY

A number of firms of long standing on the contracting and manufacturing side of the Industry have collaborated with the "JOURNAL" in the production of a series of articles, under the above title.

W. J. Jenkins & Co., Ltd.

Two outstanding principles were laid down by the founder of this Firm, and rigidly adhered to during his lifetime and career. In the design of every type of plant he endeavoured to combine simplicity with efficiency, and in the execution of orders he was insistent on the vital point of service, both during and after the execution of the contract. On these principles he built up the Company to its high and well recognized position in the contracting side of the Gas Industry, and these tenets have been followed since his death and are to-day the keystones of the Company's endeavour.

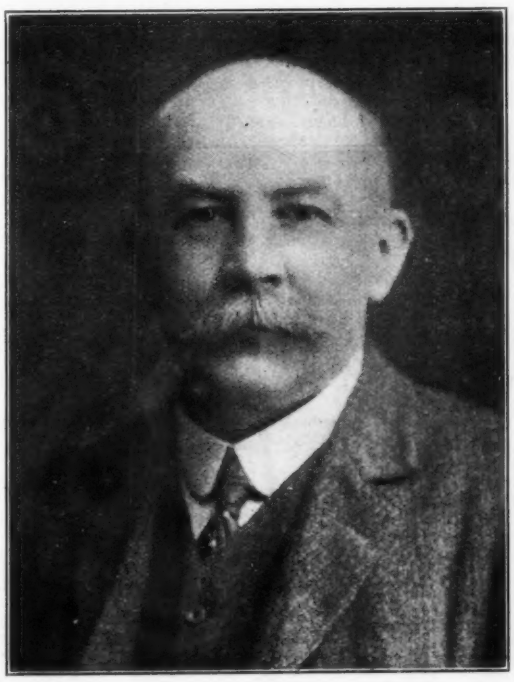
The Founder.

The founder who set these high ideals was Mr. W. J. Jenkins. He was born in Herefordshire in 1860, and began his engineering training with the old-established Company of William Allchin, Ltd., of Northampton, and following this apprenticeship Mr. Jenkins studied at King's College, London, eventually obtaining Membership of the Institution of Civil Engineers. On completing his studies he obtained a position with the Midland Railway Company at their Works at Derby, and subsequently went to the well-known Firm of West's Gas Improvement Company, then situated at Maidstone. He remained with them after their move to Manchester in 1884, eventually holding an important position in the Company.

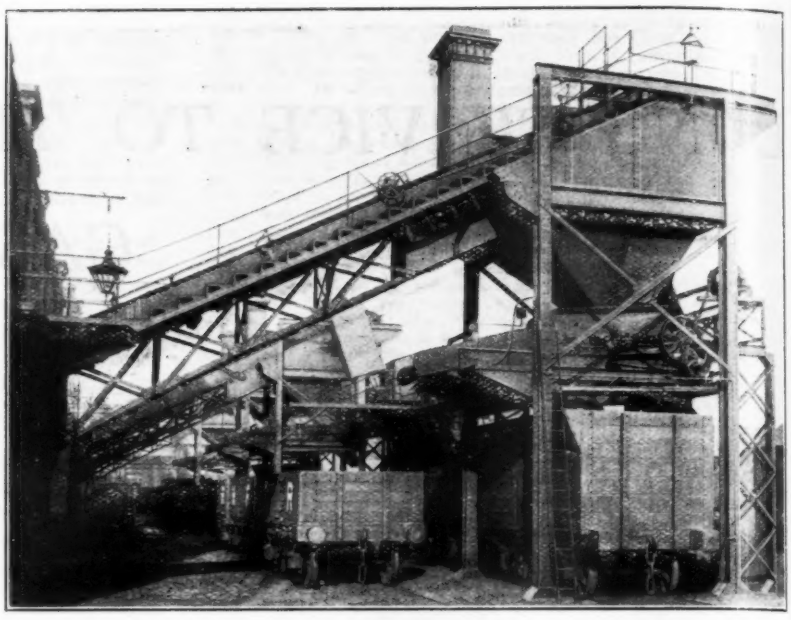
During his apprenticeship and subsequent studies Mr. Jenkins formed a friendship with a youth of his own age, John Goodman, and this friendship lasted up to his death. Young John Goodman followed a different career, and will be more easily recognized as Professor Goodman, of Leeds University, a name well known and honoured in not only the Gas Industry but every branch of engineering. In 1896 Mr. Jenkins decided to start business on his own as a Gas Engineering Contractor, and a private company was formed in which his friends Professor Goodman, Mr. C. P. Smith, of Northampton, and Major L. J. Trafford were associated with him. Retford was selected as the site for the Works and Head Office on account of its excellent position on the intersection of the old Great Northern main line with the Manchester, Sheffield, and Lincoln Railway. In addition, it was in close proximity to the iron and coal fields and to the large South Yorkshire manufacturing area. An existing factory was also available at Retford which had formerly belonged to the old-established firm of Charles Hopkinson & Co., who had carried on business as iron founders and millwrights, and this Works was well laid out and had its own railway siding. It is interesting to note that Messrs. Jenkins have a link with the former owners of the Beehive Works in the person of their present Secretary, Mr. P. Fishburne, who was on the staff of Messrs. Hopkinson prior to the purchase of the undertaking by Mr. Jenkins, and has been in their service continuously to the present day.

The De Brouwer Patents.

Due to Mr. Jenkins' established reputation, a large volume of business was obtained from the beginning, and to cope with this and to permit expansion the company was floated as a private limited company in 1898—within two years of its foundation. In the early days work undertaken was of a general character, but of course principally



W. J. Jenkins, Founder of the Firm.

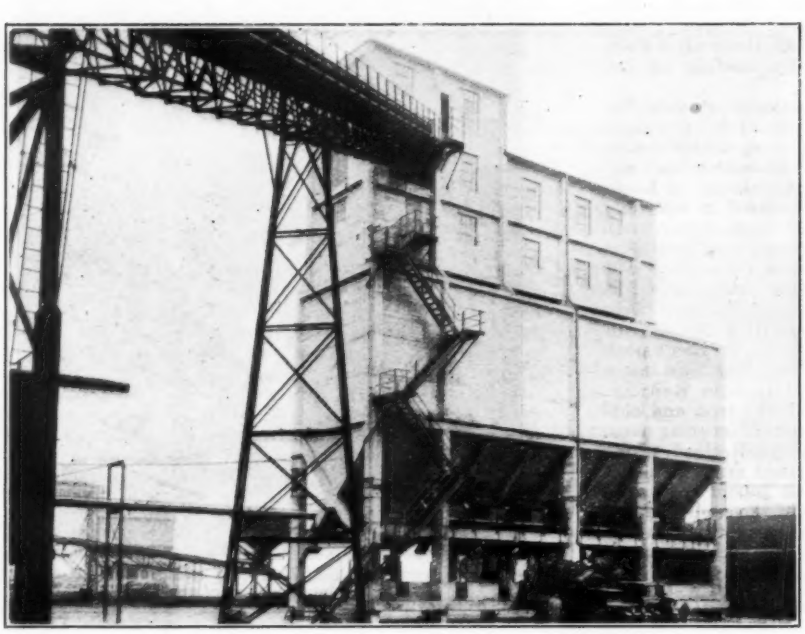


A typical pre-war installation by W. J. Jenkins & Co., Ltd., showing the four inclined portions of D B patent hot coke conveyors working in conjunction with automatic feeding and screening machinery.

in connection with the Gas Industry, but in 1902 Mr. Jenkins secured from Monsieur De Brouwer, the Gas Engineer of Bruges, Belgium, the British and Colonial rights for the manufacture of his stoking machine and other retort house appliances. The design of these machines was intensively studied by Mr. Jenkins and his staff, and many radical improvements were incorporated during the next years. Their introduction to the British Gas Industry met with an immediate and encouraging response, and the success of this venture was assured by the early flow of orders. Among the first users of the stoking machines were three gentlemen who, to-day, hold eminent positions in the Gas Industry, namely, Sir John Ferguson Bell, the present Chairman of Derby Gas Company, Mr. Douglas Helps, of Reading, and Mr. H. Simmonds, of Bury. An indication of the volume of orders which ensued is obtained from the Company's records, which show that on two occasions over 30 machines with their ancillary coal and coke handling equipment were going through the shops at the same time, orders having been received from most of the principal gas companies in Great Britain in addition to Colonial and foreign orders from South Africa, Canada, Australia, New Zealand, Norway, South America, Japan, India, and the United States of America.

In addition to these specialized productions, the Firm were early in realizing the need for mechanical handling plant for coal and coke, and coke handling and grading plants were being designed and manufactured by Messrs. Jenkins long before the war, when the realization of this side of gas works activity was very much in its infancy. The design and construction of horizontal retort benches was also carried on with that of stoking machines, and many complete retort house installations with all the ancillary handling plant were executed during the years 1900-1911. In addition, their facilities and experience allowed them to branch out into the coke-oven industry, and such plant as coal cars, coke rams, coal levellers, and coke quenchers, and other coke-oven plant parallel with their gas-works activities were included in their manufactured products.

The Firm suffered a great loss with the early and untimely death of the Founder in 1911, but the continuity of control was carried on by Professor Goodman, who eventually became Chairman of the Company, from which position he retired in 1932. The name of Goodman is still associated with the Company in the person of their Director, Mr. R. M. Goodman, who joined the Company on his return from active service in 1919. The present Managing



One of Jenkins' most recent installations—the coke screening and grading plant at the Wandsworth works, which has recently been described in detail in the columns of the "JOURNAL."

Director, Mr. J. L. Butler, also joined the Company in the same year, becoming General Manager in 1922 and Managing Director in 1925.

The War and After.

During the War years, in common with all other engineering companies, their normal production was seriously restricted, and practically the whole output was devoted to heavy machine tools for shells, rolling mill equipment, kite balloon winches, and Tanks.

After the War the Works were considerably enlarged and re-equipped with modern plant and machinery, and normal activities were resumed to cope with the volume of work resulting from five years' restriction of expenditure by the Gas Industry. Mechanical handling plant for coal, coke, and ashes began to occupy an increasing volume of the output, and their early experience in this field stood the Company in good stead. The design and construction of retort settings—which had been curtailed on the death of Mr. Jenkins—was again continued actively. During Mr. Jenkins' control of the Company experimental work on vertical retorts—on the Wilson system—had been carried out and a few plants erected. This activity was again investigated by the Company in 1929, and as a result the British and Colonial rights for the manufacture of intermittent verticals was obtained from the well-known gas engineering firm of Messrs. Aug. Klönne. Intermittent vertical carbonization has been much more developed on the Continent than in Great Britain, and Messrs. Klönne have 30 years' experience of this system, and their plants incorporate the result of this long experience in the design and manufacture. Messrs. Jenkins are fortunate in having the closest association with Messrs. Klönne, and as a result the early troubles which might have been expected have been completely avoided. To date, they have been entrusted with the erection of intermittent vertical plants with outputs varying from 170,000 to 1,300,000 cu.ft. per day, and plants are at present in operation carbonizing very successfully, with high thermal yields, coals which some years ago were classed as difficult and unsuitable for carbonization in any vertical system.

An Electric Gas Generator

by

IVAR HOLE,

Ingenior, M.N.I.F., Oslo, Norway.

From a Paper read before the 28th Annual Convention of the Canadian Gas Association at Quebec last June.

The generation of gases or treatment of such by means of electric energy has been the subject of considerable study and work, and a number of patents have been taken out for devices in which to carry out the reactions.

Broadly stated, the object of using electric energy for such purposes may be said to consist in:

1. To obtain a continuous supply of the cleanest possible gas, for instance water gas.
2. To effect chemical transformations of gases, for instance the conversion of carbon dioxide into monoxide.
3. To raise the temperature of gases.
4. To convert electric energy into combustible gases—*i.e.*, an energy transformation.

The last named item may have actuality in cities with a surplus of cheap electricity, where the demand for gas for household or technical uses exceeds the capacity of the gas-works.

The main common characteristics for an apparatus in which to accomplish these things may be stated as follows:

1. Simple and reliable design and operation.
2. Small maintenance and repair costs.
3. Continuous operation.
4. Complete gas reactions.
5. No electrode consumption.
6. High thermal efficiency.

An apparatus in which all the above named objects may be attained and which has proved very useful for its purpose has been developed by a Norwegian firm, about five years ago. It produces water gas from anthracite and steam. A short account of this generator might be of interest. Its performance has been rather remarkable, as electric gas generators go.

It consists principally of a vertically placed cylinder lined with firebrick and filled with carbonaceous material, which is charged at the upper end. Steam is introduced at the lower end and the gas taken out at the top. The electric energy is introduced near the bottom and at the top, through carbon electrodes (Söderberg). Single phase current is used.

The first generator was put into operation in the spring of 1930. It uses 250 kw. and produces about 6,000 cu.ft. per hour. In 1933 another generator was added. This has a continuous load of 400 kw. and produces 10,000 cu.ft. per hour.

Both generators produce water gas of the following approximate composition (dry gas):

CO_2	1	% (vol.)
CO	48	,,
H_2	51	,,
SO_2	0·1	,,
N_2	0·1	,,

This gas has a calorific value of 310 B.Th.U. per cu.ft. Its moisture content is between 5 and 10%, and its outgoing temperature is kept at about 1,000° F. This temperature may be regulated by raising or lowering the top electrode. The gas contains very little dust and is easily cleaned if required.

The energy input is mainly regulated by varying the voltage under load. The load curve is practically a straight line and very little regulation is necessary. The electrode consumption is remarkably small, being about 0·075 lb. per 1,000 cu.ft. of gas.

The carbon material used in these generators is anthracite in lumps not exceeding 4 in., with an ash content of about 3%. Per 1,000 cu.ft. of dry gas is used 18 lb. of anthracite, exclusive of a small loss in the ash. Any low-ash coke of sufficient mechanical strength, also charcoal, is equally usable. Ordinary coke has not had much success in the present design, owing to formation of crusts on the wall in the lower part of the generator. There can be no doubt, however, that ordinary coke may also be used, with proper design.

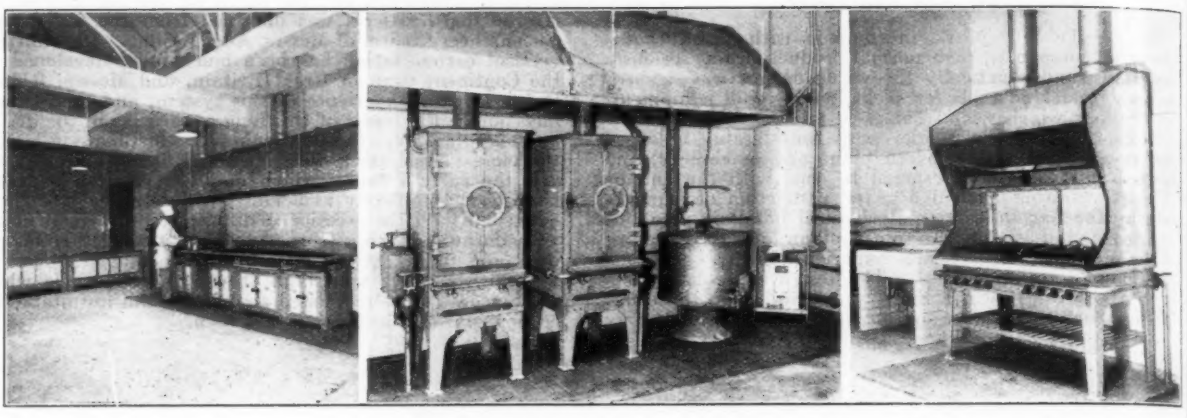
The amount of steam required per 1,000 cu.ft. of moist gas is 26 to 28 lb. Water has been used instead of steam, but the latter is preferable, permitting of a more even and easily controlled distribution.

The operation of the generator is very simple and it requires a minimum of attention. The carbon material is charged every 2 hours and the ash removed every 8 hours, without disturbing the operation of the generator. The gas is controlled as to its moisture content and CO_2 and the steam input as well as the electrical load varied accordingly, the gas demand being of course also taken into account in these respects. The gas is of an excellent quality and very uniform in composition.

When properly attended the generator will run for years without appreciable repairs. At intervals, which may have a duration of 5 months, the generator has to be emptied and cleaned. Changes in the design purporting to lengthen these intervals are feasible and are contemplated at the plant in question. The proper regulation and distribution of the steam is very important for a successful operation, also that the ash is thoroughly removed.

The exploitation of the generator has been undertaken by the Norwegian firm Elektrokemisk Industri, of Kongens gate 18, Oslo, Norway.

New All-Gas Kitchen



The major gas appliances in the kitchen are illustrated above.

at the Alexandra Palace

In view of the proposed utilization of the Alexandra Palace, Wood Green, as the London station of the B.B.C. for the transmission of television, as well as the extended use of the Palace for exhibitions and other purposes, the restaurant and kitchen accommodation have been entirely modernized. To those who had experience of the previous facilities this step will be a welcome one—and that gas has played a major part in the modernization scheme is a cause for gratification.

Through the courtesy of the Tottenham and District Gas Company, who were responsible for the installation of the gas apparatus, we were enabled the other day to inspect the culinary department at the Palace—and, as the accompanying illustrations indicate, a very fine example of a gas kitchen it is, skilfully planned on labour-saving lines and fully equipped with the most modern gas apparatus.

The major gas appliances, which enable the kitchen to cater for some three hundred people at a time, include a two-pan fish fryer, a gas boiler for hot water, vegetable steamers, two 24-in. table ranges, and one 36-in. oven, griller, three hot closets which will together accommodate nearly a thousand plates, and a tea making set.

The majority of the gas equipment is finished in grey mottled enamel with white enamelled doors and side panels, giving the whole kitchen a bright and cleanly appearance. Large canopies effectively vent the ranges and assist in keeping the kitchen at a comfortable working temperature for the staff. The Tottenham Company are to be congratulated on securing so valuable a contract for gas and for planning and equipping the kitchen in a manner which must redound to the credit of the Industry.

Gas Undertakings' Results

Colwyn Bay.

The Colwyn Bay Council reports that the gas sold during the past year amounted to 192,461,800 cu.ft., an increase of 3,150,500 cu.ft., or 1·6% over the previous year. The total income from the sale of gas, residuals, &c., was £48,084 and the total expenditure £32,370, leaving a gross profit of £15,713.

Morecambe.

In reviewing the Morecambe Gas Department balance-sheet, the Chairman, Alderman J. C. Wilson, revealed that the Undertaking had had a very successful year's working, the gross profit amounting to £18,367, but this amount was reduced to a net profit of £1,530 after making provision for interest on loans, sinking fund, income-tax, &c. The reserve fund at April 1, 1934, was £714. To this was added the profit for the year from the revenue appropriation account, making a total of £2,255. From this sum revenue contributions to capital have been made for land, costs of the 1934 Gas Order, payment of the effluent and benzole plant, amounting to £1,862, which left a reserve fund of only £393. The receipts from the benzole plant, £1,004, proved more than sufficient to pay for this plant out of revenue in the first year. The quantity of gas sold for the year was 200,860,000 cu.ft., an increase of 8 million cu.ft. over the previous year. The largest increase was in the supply of gas for street lighting, which took 20,153,000 cu.ft., representing an increase of nearly 7 million cu.ft. over the previous year.

Newcastle-under-Lyme.

At the annual meeting of the Newcastle-under-Lyme Gas Committee held on Oct. 4, the Engineer, Mr. F L. Wimhurst, reported that the financial position of both the Newcastle and Chesterton Works showed a very successful year's trading. For the year ended March 31 last, the total income of the Newcastle Works was £62,428 as compared with £29,470 for 1934, being an increase of £2,956; while the total expenditure was £25,817 as compared with £24,706. The gross profit showed an increase of £1,110. The total income of the Chesterton Works was £28,270, as compared with £30,504, a decrease of £2,233; while the expenditure was £24,346, as against £24,022. There was a net decrease in the total gross profit of the whole Undertaking of £712. The Basford area having been previously supplied by Chesterton and now supplied from the Newcastle Works, an estimate of £400 had been made of the loss of profit to the Chesterton Works. The net revenue account of the combined Undertakings showed a decrease in expenditure for the year of £506 and a decrease in income of £216, thus giving a net profit for the year of £1,083, as against £1,505, a decrease of £42. The balance at the end of 1934 stood at £14,371 and the balance to be carried forward was £12,749. Sanction had been obtained during the year for a loan of £10,000 on new mains, but it has not yet been taken up. In supplying details of the cost of production and the revenue from sales, Mr. Wimhurst expressed the hope that the new gasholder would mature during the coming year, as it was difficult and risky to have an output of almost 100% more than the capacity of the present gasholders. The demand for gas cookers was increasing and the water heating business was making good progress, while the reduced scale of charges which came into force at the December quarter should be an additional inducement for the use of gas fires. The sales of gas had increased by 0·317% on the previous year and there had been an increase of 783 in the number of consumers.

Newton-in-Makerfield.

The annual report of Mr. F. C. Sylvester, Engineer and Manager of the Newton-in-Makerfield Gas Department, states that the gas made for the year ended March 31, 1935, was 116,762,000 cu.ft The gross profit for the year was £3,312, which, after payment of sinking fund and interest charges, leaves a net profit of £172, which has been carried to appropriation account. During the year this fund has also provided for the renewal of a bed of the vertical retorts and new showrooms. The loans outstanding are being rapidly reduced and now stand at only £14,637 or £139 per million cu.ft. sold. The average price received for all gas sold was 3s. 0·6d. per 1,000 cu.ft., and with the introduction of a new scale of charges the industrial load is steadily developing at the local works. There has been an increase of 222 consumers, while the sales of all classes of appliances, through the showroom has shown a remarkable increase from £1,621 last year to £4,466.

Severn Valley Gas Corporation, Ltd.

Increase of Capital to £1,500,000 Authorized

Major Julian Day's Address

An Extraordinary General Meeting of Severn Valley Gas Corporation, Ltd., was held at Winchester House, Old Broad Street, London, E.C., on Tuesday, Oct. 22. Major JULIAN DAY (the Chairman) presided.

The business of the meeting was to approve the following resolution:

That the share capital of the Company be increased to £1,500,000 by the creation of 500,000 new shares of £1 each, of which 300,000 shall be 4½% Cumulative Preference Shares and 200,000 shall be Ordinary Shares conferring upon the holders thereof the rights and privileges and subjecting them to the restrictions provided by the Company's Articles of Association with regard to the 4½% Cumulative Preference Shares and the Ordinary Shares respectively in the existing capital of the Company.

Major Julian Day said:

"The present authorized capital of the Corporation is £1,000,000, divided into:

400,000	4½% Cumulative Preference Shares of £1 each, of which there have been issued	319,510 shares;
400,000	Ordinary Shares of £1 each, of which there have been issued ...	355,698 shares;
and 200,000	Deferred Shares of £1 each, of which there have been issued ...	100,000 shares.

Thus there remain at the present date, authorized but as yet unissued, the following shares: 80,490 Preference Shares; 44,302 Ordinary Shares, and 100,000 Deferred Shares.

"If the Resolution which has been read to you is duly passed, the number of authorized but unissued Preference Shares will be increased to 380,490 Shares; and the number of authorized but unissued Ordinary shares will be increased to 244,302 shares.

"Since the date of the last Accounts, the Corporation has acquired majority holdings in the following seven Companies—namely: Newport (Mon.) Gas Company, Bromyard Gas Light and Power Company, Ltd., Whitchurch (Salop) Gas Company, Ltd., Dawley Gas Company, Ltd., Wem Gas Light and Coke Company, Ltd., Welshpool Lighting and Power Company, Ltd., and Broseley Gas and Coke Company, Ltd.

"The addition of these Companies brings the total number of Companies now in the group to seventeen.

"All these Companies operate in the general area served by this Corporation and throughout which it is the purpose of the Corporation to bring about consolidation and co-ordination of the Gas Industry.

"The total of the Corporation's Investments has grown from £672,112, reported in the last Accounts, to over £950,000 at this date.

"You are now asked to create additional capital in order to facilitate the continuance of the Corporation's policy of offering to the holders of securities of individual companies which may hereafter be added to the Group either shares in this Corporation or cash, at the option of each shareholder. The present amount of unissued capital, especially in respect of Ordinary Shares, is not sufficiently large to permit of major operations of this character.

"On this occasion I shall not attempt to give you a general survey of the Corporation's activities since the last Annual Meeting, but I can assure you that steady progress is being made in extending the use of gas and gas appliances throughout the areas of the various Companies in the Group, and in bringing into effect lower charges to consumers.

"We ask your continued support in our work of consolidating the Industry in our area for the benefit of all concerned."

After the resolution had been moved and seconded, it was unanimously adopted.

This pre-cast Lead Ring

cuts out
run lead and caulking

Using a spanner as his only tool, an unskilled workman can make the Stanton Mechanical Lead Joint in a fraction of the time which it takes a skilled hand to run lead into and caulk an open socket joint. A pre-cast lead ring is slipped over the spigot, two half-collars are placed in position, and the jointing operation is completed by the tightening of four cast-iron set-screws.

Inside the lead ring is cast a corrugated steel spring insertion ring, which uniformly distributes the end pressure so that the joint is effective throughout its full depth—and not for a portion only as in a caulked joint. The ring is mechanically held in position and cannot be dislodged by "drawing" of the spigot.

PATENT No. 404955
OTHER PATENTS
PENDING

STANTON
MECHANICAL
LEAD JOINT

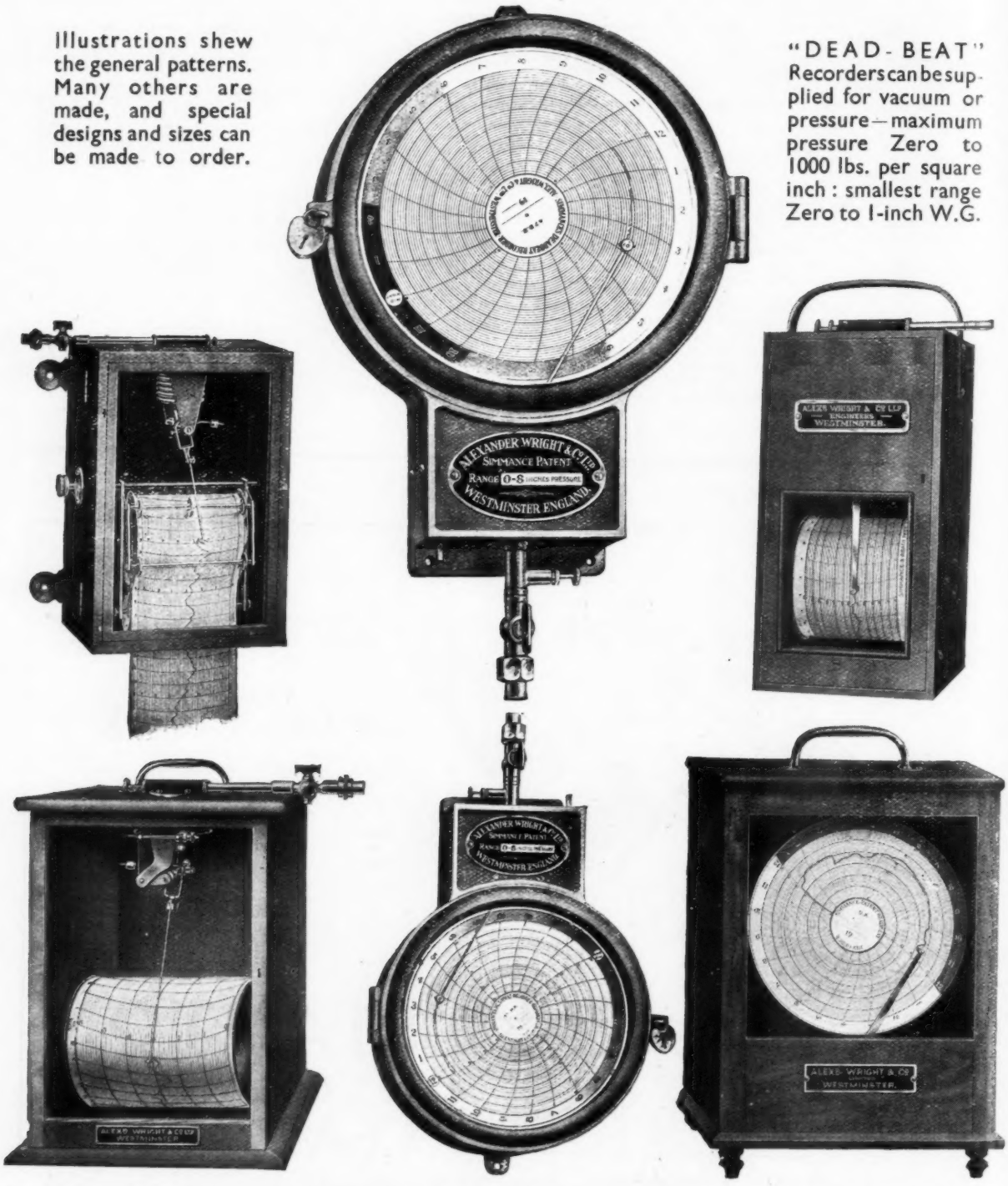
THE STANTON IRONWORKS COMPANY LIMITED, Nr. NOTTINGHAM

Before deciding on pressure or vacuum recorders it will pay you to consider the advantages of installing "DEAD-BEAT" Recorders. First and foremost, they are accurate (guaranteed to ± 1% of total scale) and retain initial calibration accuracy; they are extremely sensitive (damping valve is fitted to restrain excessive oscillations) and they are reliable.

In no case has a "DEAD-BEAT" Recorder failed its guarantee

Illustrations shew the general patterns. Many others are made, and special designs and sizes can be made to order.

"DEAD-BEAT" Recorders can be supplied for vacuum or pressure—maximum pressure Zero to 1000 lbs. per square inch: smallest range Zero to 1-inch W.G.



ALEXANDER WRIGHT & CO., LTD., WESTMINSTER, S.W.1

Gas Markets and Manufactures

Stock Market Report

(For Stock and Share List, see later page)

Throughout last week business in all sections was meagre in volume and prices were affected one way or the other by even the smallest transaction. It is true there was continued support for iron, steel, and aircraft shares, but profit-taking put an end to any further improvement in value. The Account closed on Friday with a dull tone, and in the almost complete absence of buyers prices in most sections were marked down. It is obvious that unless diplomatic affairs take a speedy turn for the better conditions will remain dull for some time to come.

Comparatively, the Gas Market was a little better supported than some sections, though it was not without its share in the marking-down process. Preference and debenture stocks were the chief sufferers, and it will be seen in the Stock and Share List that many of these lost from 1 to 3 points—British 7% preference dropping 5 to 157½. On the other hand, it is satisfactory to note that the ordinary stocks were firm and several of the leaders gained ground. Gas Light units strengthened 3d. to 26s. 6d.; Imperial Continental was moved up a further 4 points to 214½. A demand for Oriental stock, which is full of the final dividend, took the price 4½ points higher at 169½, while, on the local Exchange, Liverpool recovered the point lost a week ago.

The Swansea Company's 3½% redeemable debenture stock, £94,000 of which is outstanding, is now officially quoted on the London Stock Exchange, and has therefore been included in the Stock and Share List—the quotation being 97-102.

Current Sales of Gas Products

The London Market for Tar Products.

Oct. 21.

There are no changes to record in the prices of Tar Products, which remain as follows:

Pitch, 32s. 6d. per ton f.o.b.

Creosote is firm at about 5¾d. per gallon.

Refined tar, 4d. per gallon in bulk at makers' works.

Pure toluole, 2s. 3d. to 2s. 4d.; pure benzole, 1s. 7d. to 1s. 8d.; 95/160 solvent naphtha, about 1s. 6d.; and 90/160 pyridine, 4s. 6d. to 4s. 9d.—all per gallon naked at makers' works.

Tar Products in the Provinces.

Oct. 21.

The average prices of gas-works products during the week were: Gas-works tar, 17s. 6d. to 22s. 6d. Pitch—East Coast, 31s. to 33s. f.ob. West Coast—Manchester, Liverpool, Clyde, 31s. to 33s.* Toluole, naked, North, 2s. to 2s. 1d. Coal-tar crude naphtha, in bulk, North, 7d. to 7½d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 5½d. Heavy naphtha, North, 11d. to 11½d. Creosote, *ex* works, in bulk, North, liquid and salty, 4¾d. to 5d.; low gravity, 4¾d. to 4⅞d.; Scotland, 4⅝d. to 4¾d. Heavy oils, in bulk, North, 4¾d. to 5d. Carbolic acid, 60's, 2s. to 2s. 2d. Naphthalene, £12 to £14. Salts, 70s. to 75s. bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Oct.* 19.

There has been a fair amount of activity during the week and prices of most products are steady to firm.

Crude gas-works tar.—The actual value is 26s. to 28s. per ton *ex* works in bulk.

Pitch continues without interest at 30s. per ton f.o.b. Glasgow for export, and 30s. per ton *ex* works in bulk for home trade.

Refined tar is comparatively quiet, although makers are maintaining quotations at 2⅞d. per gallon, f.o.r. in buyers' packages.

Creosote oil is well sold on contract, but new business is not too plentiful. B.E.S.A. Specification, 5¼d. to 5⅝d. per gallon; low gravity, 5¼d. to 5½d. per gallon; and neutral oil, 5¼d. to 5½d. per gallon; all f.o.r. in bulk.

Cresylic acid has been quite active, and fair quantities have changed hands at the following prices: Pale, 97/99%, 1s. 2½d. to 1s. 3½d. per gallon; dark, 97/99%, 1s. 1d. to 1s. 1½d. per gallon; and pale, 99/100%, 1s. 3½d. to 1s. 4½d. per gallon; all *ex* works naked.

Crude naphtha.—Available supplies are small. Value is 4½d. to 5d. per gallon f.o.r., according to quality and district.

Solvent naphtha.—90/160 grade is 1s. 3½d. to 1s. 4d. per gallon, and 90/190 heavy naphtha is nominal at 11½d. to 1s. per gallon.

Motor benzole is quoted in small quantities at 1s. 3½d. to 1s. 4d. per gallon in bulk at makers' works.

Pyridines.—90/160 grade is 5s. 6d. to 6s. per gallon, and 90/140 grade, 6s. to 6s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s. d.		s. d.	
Crude benzole . . .	0 9½	to	0 10	per gallon at works
Motor ,, . . .	1 3	,,	1 3½	,, ,, ,,
90% ,, . . .	1 4	,,	1 4½	,, ,, ,,
Pure ,, . . .	1 7½	,,	1 8	,, ,, ,,

Contracts Advertised To-Day

Electric Generator.

Hinckley Gas Department. [p. 280.]

Gasholder Resheeting.

Ennerdale Rural District Council. [p. 280.]
Singapore Gas Department. [p. 280.]

Trade Notes

Gas-Works Plant for Ireland.

Owing to the continued progress of the Gas Department at Bangor (Co. Down) considerable extensions have been found necessary. We understand the Engineer, Mr. B. Mitchell, has been visiting this country, and placed the orders for new condensing and washing plant with Messrs. R. & J. Dempster, Ltd., of Manchester.

Heat Resisting Steels.

"Shadrach," "Meshach," and "Abednego" heat resisting steels are claimed to possess the quality of withstanding exceedingly high temperatures without destruction, and we have received a brochure dealing with the activities of the manufacturers, Messrs. Head, Wrightson, & Co., Ltd., Teesdale Iron Works, Thornaby-on-Tees, which should interest the gas engineer, as it contains a section dealing with the use of heat resisting steels in the gas-works.

Further Gas Undertakings' Results

Blackpool.

The gross profit of the Blackpool Gas Department for the year ended March 31, 1935, is £34,847, and after deducting loan amounting to £22,094, there remains a net profit of £12,753. There has been a decrease of £277 in the revenue from tar, although the tonnage sold increased by 491 tons, and this has been due to the reduced price obtainable for pitch due to competition from other countries. A benzole extraction plant was installed during the year, and after six months' working of this plant the revenue obtained was £1,693 from the sale of benzole and naphtha. At March 31, 1935, there was a total of 37,643 consumers; 20,842 of these are supplied with ordinary meters, and 16,801 are provided with prepayment meters. During the year 2,277 new consumers have been connected to the supply mains. 978 ordinary meters have been changed to prepayment meters and 164 prepayment meters have been changed to ordinary meters. The average consumption per consumer during the year was 34,490 cu.ft. The average consumption through ordinary meters being 44,652 cu.ft. The average consumption through prepayment meters being 21,824 cu.ft. The number of street lamps within the borough is now 5,272, and accounts for 89,489,900 cu.ft. of gas used. Over 352 new lamps have been erected during the year in the area of gas supply. During the year a 30-in. trunk main was laid from the Princess Street Works to the new site at Marton. The new 3 million cu.ft. gasholder was erected on this site, and it is pleasing to note that the holder has given entire satisfaction and has assisted in the levelling-up of district pressures particularly during the August peak loads. A new benzole plant was installed in September, 1934, capable of dealing with 5 million cu.ft. of gas per day and capable of extracting 1½ gallons of benzole per ton of coal. 35,802 gallons of benzole and 7,134 gallons of naphtha were recovered during the six months' working of the plant. The business conducted through the showroom has been satisfactory and apparatus to the value of £32.230 has been sold. During the year 18 miles 856 yds. of mains have been laid. There was an increase in the gas sold of 25,507,200 cu.ft., or 2%.

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WEST'S MECHANICAL HANDLING SYSTEMS

THE FIRST COAL-HANDLING BELTS...
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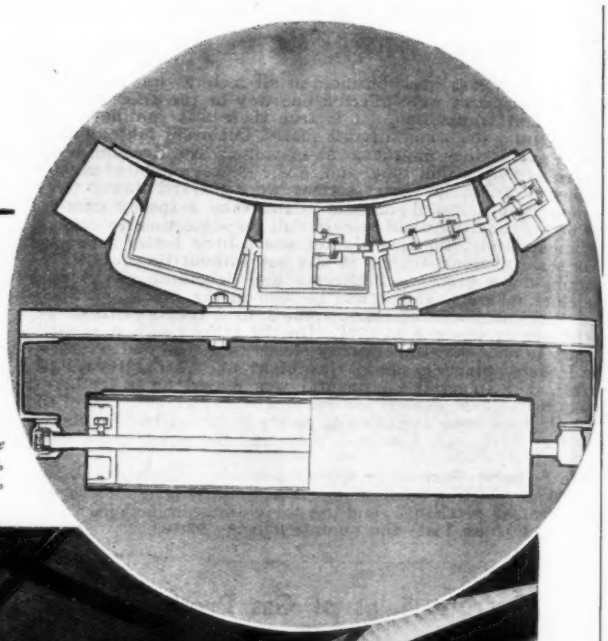


"West" belt conveyor at the Nine Elms works of the Gas, Light and Coke Company, London.

Belt Conveyors, Elevators, Skip-hoists

•

The West Lip-bucket Conveyor with Automatic forced Lubrication

•

The West Coal Breaker

•

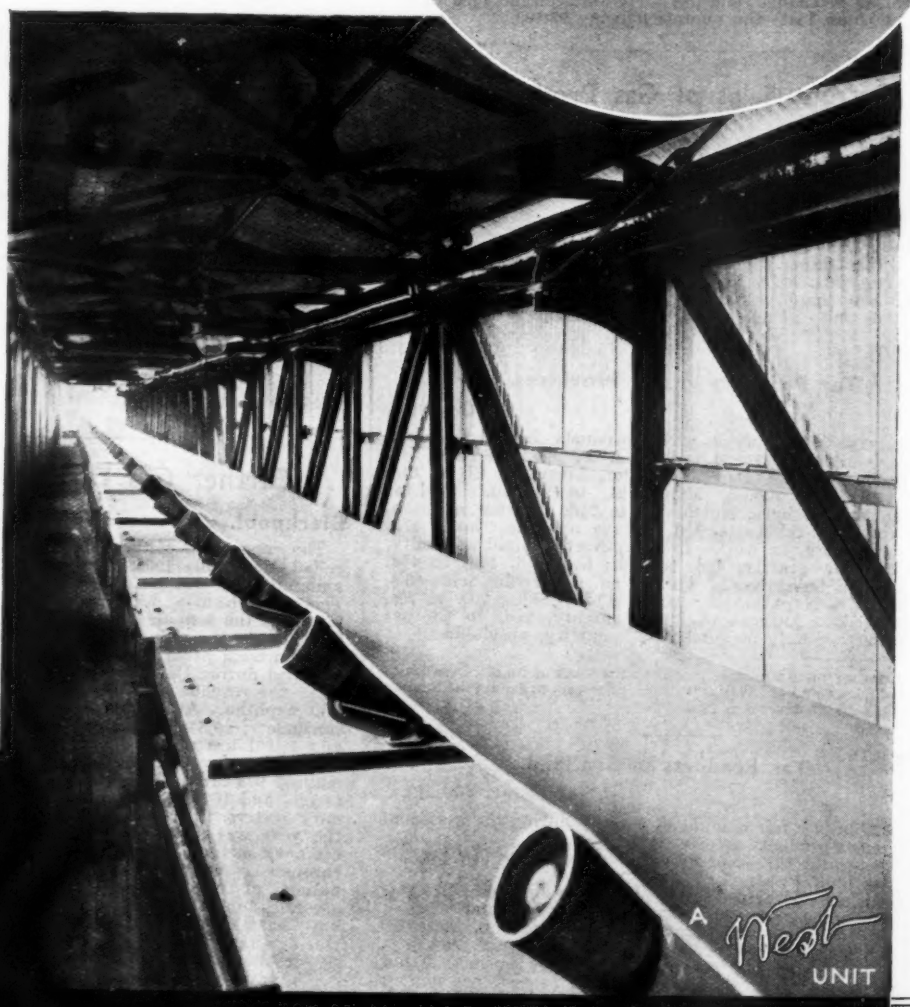
The West-Calvert Coke Cutter

•

The West Coke Grader

•

Wagon Tipplers, Telpherage and Crane Equipment, etc.



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WEST'S GAS IMPROVEMENT COMPANY, LTD.

MANCHESTER: Albion Ironworks, Miles Platting

LONDON: Regent House, Kingsway, W.C.2

STOCK AND SHARE LIST

Official Quotations on the London and Provincial Stock Exchanges

Issue. £	Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf.Yr. % p.a.	NAME.	Quotations Oct. 18.	Rise or Fall on Week.	Transactions, Lowest and Highest Prices During the Week.
1,551,868	Stk.	Sept. 9	7	7	Alliance & Dublin Ord. ...	130—140	...	138½
374,000	,,	June 24	4	4	Do. 4 p.c. Deb. ...	97—102	...	...
557,655	,,	Aug. 12	7	7	Barnet Ord. 7 p.c.	165—170	...	...
300,000	1	Oct. 7	1/9⅞	1/4½	Bombay, Ltd.	1⅛—1⅜*	...	28/9—29/-
178,480	Stk.	Aug. 12	9⅛	9⅛	Bournemouth sliding scale ...	222—232	...	...
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	168—173	...	170—173
489,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	147—152	...	150—152
50,000	,,	June 24	3	3	Do. 3 p.c. Deb. ...	83—88	−2	...
262,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	105—110	−1	...
335,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	123—128	...	...
357,900	,,	Aug. 12	7½	7½	Brighton, &c., 6 p.c. Con. ...	170—175	...	...
649,955	,,	,,	6½	6½	Do. 5 p.c. Con. ...	156—161	...	...
205,500	,,	,,	6	6	Do. 6 p.c. B. Pref.	142—147	...	...
1,487,500	,,	July 8	5	5	Bristol, 5 p.c. max.	120—122*a*	...	...
120,420	,,	June 7	4	4	Do. 1st 4 p.c. Deb. ...	102—104*a*	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	101—103*a*	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	127—130*a*	...	...
855,000	,,	Sept. 23	8	7	British Ord.	152—157	...	...
100,000	,,	June 7	7	7	Do. 7 p.c. Pref.	155—160	−5	155
350,000	,,	,,	5½	5½	Do. 5½ p.c. "B" Cum. Pref.	112—117	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	109—114	...	...
200,000	,,	,,	...	17/6⅝	Do. 3½ p.c. Red. Deb. ...	99—101	...	...
100,000	10	22 May '33	6	4	Cape Town, Ltd.	1—3	...	...
100,000	10	6 Nov.'33	4½	4½	Do. 4½ p.c. Pref. ...	1—3	...	...
150,000	Stk	June 24	4½	4½	Do. 4½ p.c. Deb. ...	83—88	...	...
626,860	,,	July 22	6	6	Cardiff Con. Ord.	127—132	...	129½—130½
237,860	,,	June 7	5	5	Do. 5 p.c. Red. Deb.	107—112	...	...
157,150	,,	Aug. 12	6½	5	Chester 5 p.c. Ord.	109—114*b*	...	...
98,936	1	Sept. 23	2/-	2/-	Colombo, Ltd., Ord.	1⅝—1⅞	...	...
24,500	1	,,	1/4½	1/4½	Do. 7 p.c. Pref. ...	20/—22/	...	...
609,204	1	Oct. 7	-/11/48	-/11/48	Colonial Gas Assn. Ltd. Ord.	19/6—21/6*	...	...
296,053	1	,,	1/3/30	1/3/30	Do. 8 p.c. Pref.	24/6—26/6*	...	...
1,775,005	Stk	Aug. 12	6	5	Commercial Ord.	100—105	...	102½—104
620,000	,,	June 7	3	3	Do. 3 p.c. Deb. ...	82—87	−1	...
286,344	,,	Aug. 12	5	5	Do. 5 p.c. Deb. ...	121—126	...	...
807,560	,,	Aug. 12	7	7	Croydon sliding scale... ...	151—156	...	...
569,590	,,	,,	5	5	Do. max. div.	113—118	...	116
620,385	,,	June 24	5	5	Do. 5 p.c. Deb.	123—128	...	125—126
542,270	,,	Aug. 12	10	7	Derby Con.	175—185*c*	...	...
55,000	,,	June 24	4	4	Do. 4 p.c. Deb.	100—105*c*	...	...
239,000	,,	Aug. 12	5	5	East Hull Ord. 5 p.c.	109—112	...	...
181,625	,,	Aug. 12	6	6	East Surrey Ord 5 p.c. ...	129—134	...	...
175,609	,,	June 7	5	5	Do. 5 p.c. Deb. ...	120—125	−3	...
19,313,481	,,	Aug. 12	5½	5½	Gas Light & Coke 4 p.c. Ord.	26/—27/-*f*	+.3	26/3—26/10½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	88—92	...	88—90
4,477 106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	105—108	...	107½—108
8,602,497	,,	June 7	3	3	Do. 3 p.c. Con. Deb. ...	83—87	−1	84—86
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	114—118	...	115½—117
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	112—116	...	113½—114½
270,466	,,	Aug. 12	6	6	Harrogate New Cons. ...	132—137	...	...
140,000	1	Sept. 23	1/7½	1/7½	Hongkong & China, Ltd: ...	1½—1⅞	...	...
213,200	Stk.	Aug. 12	6	6	Hornsey Con. 3½ p.c.... ...	130—135	...	...
5,600,000	,,	May 13	10	14	Imperial Continental Cap. ...	212—217	+4	213—216½
223,130	,,	July 22	3½	3½	Do. 3½ p.c. Red. Debs.	91—96	..	94½
285,242	,,	Aug. 12	8½	8½	Lea Bridge 5 p.c. Ord. ...	175—180	...	177—178
2,167,410	,,	Aug. 12	6	6	Liverpool 5 p.c. Ord.... ...	133—135*b*	+1	...
245,500	,,	June 7	5	5	Do. 5 p.c. Red. Pref. ...	105—110*b*	...	...
306,083	,,	July 8	4	4	Do. 4 p.c. Deb.	105—107*b*	...	...
165,736	,,	Aug. 26	10	8	Maidstone 5 p.c. Cap. ...	182—192	...	...
63,480	,,	June 24	3	3	Do. 3 p.c. Deb. ...	80—85	−2	...
75,000	,,	May 27	†10	†10	Malta & Mediterranean ... Metropolitan (of Melbourne)	210—220	...	...
392,000	—	Oct. 1	5½	5½	5½ p.c. Red. Deb.	98—103	...	...
231,978	Stk.	Aug. 12	5	5	M. S. Utility "C" Cons. ...	108—113	...	111½—112
818,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	100—105	−1	...
360,075	,,	June 24	4	4	Do. 4 p.c. Deb. ...	102—107	−1	105—105¾
148,955	,,	,,	5	15	Do. 5 p.c. Deb. ...	120—125	−3	...
125,000	—	July 1	3½	3½	Do. 3½ p.c. Rd. Rg. Bds.	97—100	...	...
675,000	,,	June 24	†13	†13	Montevideo, Ltd.	48—53	...	48½—50
2,061,315	,,	Aug. 12	5½	5	Newcastle & Gateshead Con.	25/—26/-*df*	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	107—108*d*	...	...
776,706	,,	June 7	3½	3½	Do. 3½ p.c. Deb. ...	100½—101½*d*	...	...
277,285	,,	Oct. 8	5	5	Do. 5 p.c. Deb. '43 ...	105—107*d*	...	...
274,000	,,	Aug. 12	5	5	Newport (Mon.) 5 p.c. max....	113—118*a*	...	...
225,000	,,	Aug. 12	7½	7½	North Middlesex 6 p.c. Con.	162—172	...	...
396,160	,,	Aug. 12	5	5	Northampton 5 p.c. max. ...	105—110	...	...
300,000	,,	Apl. 29	19	17	Oriental, Ltd.	167—172	+4½	168—170
416,617	,,	June 7	8	8	Plym'th & Stonehouse 5 p.c.	162—167	...	...
504,414	,,	Aug 12	8½	8½	Portsm'th Con. Stk. 4 p.c. Std.	172—177	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	110—115	...	...
114,000	,,	July 22	5	5	Preston 5 p.c. Pref.	106—111	...	...
321,961	1	Sept. 23	...	1,-	Severn Val. Gas Cor. Ld. Ord.	22/—23/-	...	22/—23/1½
319,510	1	,,	...	-/10½	,, ,, 4½ p.c. Cum. Pref.	21/9—22/9	...	22/-
1,736,968	Stk.	Aug. 26	6	6	Sheffield Cons.	139—141*e*	...	...
95,000	,,	June 24	4	4	Do. 4 p.c. Deb.	102—104*e*	...	...
133,201	,,	Aug. 12	5	8½	Shrewsbury 5 p.c. Ord. ...	145—150	...	...
90,000	10	May 27	†3	†3½	South African	3—4	...	...
1,061,779	1	Sept. 23	1/2‡	1/2‡	South East'n Gas Cn. Ld. Ord.	27/6—28/6	−.6	27/6—28/4½
845,016	1	,,	-/10½	-/10½	Do. 4½ p.c. Red. Cum. Pref.	22/3—23/3	...	22/6—22/7½
450,000	Stk.	Aug. 12	4	4	Do. 4 p.c. Red. Deb. ...	100—103	...	...
6,709,895	,,	Aug 12	6½	5	South Met. Ord.	120—125	...	120½—123½
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf. ...	147—152	...	148—148½
850,000		,,	4	4	Do. 4 p.c. Irred. Pf. ...	105—109	...	...
1,895,445	,,	June 24	3	3	Do. 3 p.c. Deb. ...	83—87	−1	85½—86
1,000,000	,,	July 8	5	5	Do. 5 p.c. Red. Deb....	114—117	...	115
209,820	,,	Aug. 12	8½	8½	South Shields Con.	171—173*d*	...	...
1,543,795	,,	Aug. 12	6	6	South Suburban Ord 5 p.c. ...	125—130	−1	125
512,825	,,	,,	5	5	Do. 5 p.c. Pref. ...	118—123	−2	...
500,000	,,	,,	4	4	Do. 4 p.c. Pref. ...	103—108	...	...
888,587	,,	June 7	5	5	Do. 5 p.c. Deb. ...	122—127	−1	...
250,000	,,	,,	4	4	Do. 4 p.c. Deb. ...	103—108	−2	...
647,740	,,	Aug. 12	5	5	Southampt'n Ord. 5 p.c. max.	115—120	...	116—117
121,275	,,	June 7	4	4	Do. 4 p.c. Deb.	100—105	...	...
350,000	,,	Aug. 12	5½	5½	Swansea 5½ p.c. Red. Pref. ...	112—117	...	113½—115
200,000	,,	June 7	6½	6½	Do. 6 p.c. Red. Deb. ...	98—103	...	...
94,000	,,	...	...	...	Do. 3½ p.c. Red. Deb. ...	97—102	...	...
1,076,490	,,	Aug. 12	6½	6½	Tottenham and District Ord.	149—154	...	...
409,835	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	130—135	...	...
62,235	,,	,,	5	5	Do. 5 p.c. Pref. ...	117—122	−3	...
334,615	,,	June 7	4	4	Do. 4 p.c. Deb. ...	101—106	...	...
369,774	,,	Aug. 12	7	7	Uxbridge, &c., 5 p.c.	151—156	...	153½—155½
108,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	117—122	−1	...
1,340,521	,,	Aug. 12	7	7	Wandsworth Consolidated ...	155—160	...	160
1,371 373	,,	,,	5	5	Do. 5 p.c. Pref. ...	118—123	−3	...
1,317,964	,,	June 7	5	5	Do. 5 p.c. Deb. ...	123—128	−2	127
338,300	,,	,,	4	4	Do. 4 p.c. Deb. ...	104—109	−1	...
158,400	,,	Aug. 12	6g	5	Winchester W.& G. 5 p.c. Con.	114—119	...	...

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by

R. N. Le Fevre, M.Inst.Gas E.

Officer-in-Charge of Training, The Gas Light and Coke Company, Assistant to Head of Department of Gas Engineering and Supply, Westminster Technical Institute.

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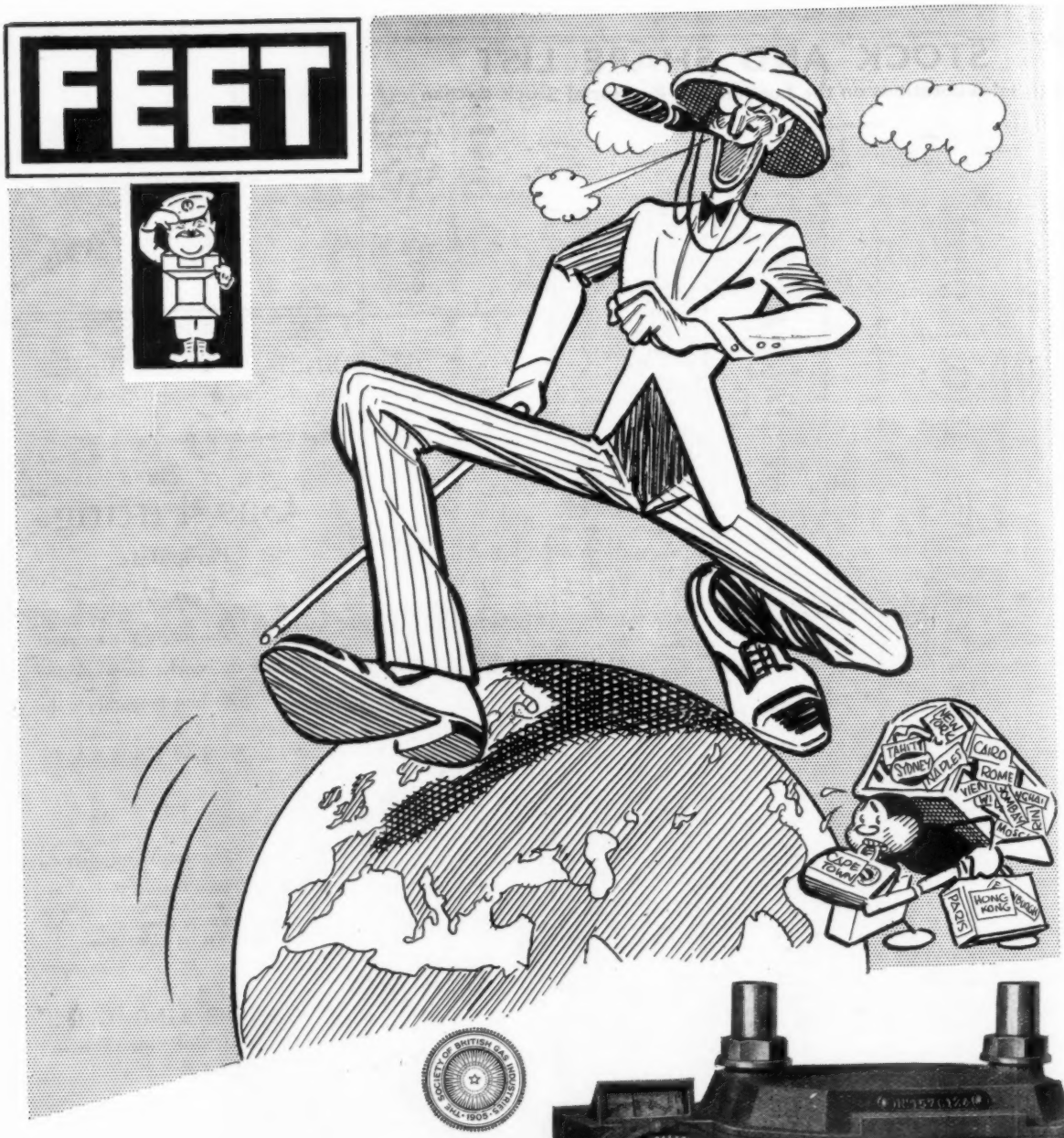

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